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Problems for the Contractor

THERE was at least one notable omission from Mr. W. B. Williams's presidential address and annual report at the Torquay meeting of the Electrical Contractors' Association. We believe that every president since the inception of the annual conference has made reference to compulsory registration or enforced wiring rules, but this year the subject was not mentioned.

It may be that the Association considers that the realisation of its hopes is too remote, or perhaps it holds the view that, after all, the National Register may be one way of achieving by less troublesome means a part of what is desired. On the other hand, it may have been found that the desire for compulsion is not so strong among the members as it was. Really the Association's insistence on this matter was somewhat altruistic, for one of its principal aims is to raise the standard of electrical installation work. Compulsion would transform this virtue into a necessity, and to this extent would render the Association superfluous.

This omission was accompanied, however, by a revival of another matter which the Association took up two or three years ago and then (apparently) abandoned. Mr. Williams said that the Association had considered schemes by which it could offer facilities to its members to finance hire-purchase transactions on the best possible terms, but he went on to say that members should not wait to be asked for hire-purchase facilities, but offer them as a matter of course.

It is not clear whether members are to proceed independently or whether they are to have the backing of the Association. The results of the latter's considerations were not made known in the report. At all events, if contractors do not offer these facilities the supply authorities must, with or without benefit to the contractors.

Mr. Williams suggested that in some places losses on the hire or sale of apparatus by supply authorities are covered by a high charge for electricity. He surely cannot have meant municipalities, for they are precluded from this by an obligation to keep separate accounts, which must balance, and not to charge less than the recognised retail prices, unless the sale is to a contractor (Clause 48 of the 1926 Act). It is true that the clause is not absolutely "watertight," for sub-section (3) provides that any question relating to recognised retail or trade prices should be considered by a committee appointed by the Commissioners. This is the celebrated "Committee D," whose deliberations have been conducted on Geneva-like lines, and whose latest draft recommendations are in the hands of its appointing bodies.

Mr. Williams referred to previous efforts to formulate a "fair trading policy," which failed to gain general acceptance. He considers that such a policy, covering the entire industry, is of vital importance. If this were strictly true we are afraid that the patient would have died long ago, while the doctors have been in consultation. But the industry has great inherent vitality. The public *will* and must have electricity and electrical appliances and the service that goes with them. If the contractors cannot or will not play their part the supply authorities must act. The real issue lies between the producer and the consumer; disputes among intermediaries must not be allowed to hinder progress.

London's Electricity Supply

THE Electricity Supply Return for 1931-32, just published by the London and Home Counties Joint Electricity Authority, shows that the kWh sold increased by 8 per cent., as against 10.6 per cent. during the previous year. The cause of the slackening in the rate of progress was presumably the general depression, as it was spread fairly evenly over the various services. The effect of the depression is also possibly indicated by the retrograde step taken by some of the local authorities in transferring some £107,000 to relief of rates, as against £76,000 in 1930-31. Consumers have not done badly, as they

saved £1,068,000 through reductions in tariffs, thus benefiting by £33,000 more than in the previous year; it is especially satisfactory to note that power consumers have not been overlooked, as their share was equivalent to 0.034d. per kWh, as compared with only 0.011d. in 1930-31. The appendix to the return, giving the prices charged to all classes of consumers by each undertaking at January 1st of this year, was issued previously, and was commented on in our leading columns of March 17th. A welcome deduction from the statistics is that the margin between the kW of installed generating plant and of the aggregate maximum demand is being steadily reduced.

Oil-engines and Peaks

NEARLY fifty oil-engine stations generating more than one-third of the output of the 166 giving statutory supplies run for pa.t of the time only, being used chiefly in conjunction with bulk supplies for relieving the peaks. That this peak load operation is not inefficient is shown by their low fuel consumption per kWh, which compares most favourably with the average figure for all similar stations with a corresponding output. Only nine stations exceed the group average, and here the difference is as great (but the other way) as it is for the majority of the stations, showing that the exceptions are not worthy representatives of the performance of this type of engine. The inference is that these peak load stations are being operated with a very close eye on plant load factor, which influences thermal efficiency to a much greater extent than does system load factor. This does not necessarily hold to anything like the same degree with steam peak load stations, where station load factor has an important bearing on boiler-house economy.

Convinced!

THE importance of bringing architects to an appreciation of the merits of electricity has long been stressed by us and others, and much has been done in the way of educational work among them. It is obvious that this is now bearing fruit, for we learn that the Royal Institute of British Architects is to adopt electric heating for its new building in Portland Place, London, W. This decision, besides being a very wise one, is of considerable significance to the electrical industry.

Indirect Savings

THE paper which Mr. S. Withington presented to the World Power Conference on the New Haven (New York) railway electrification was of especial interest, as many of the problems involved were similar to those encountered in Great Britain. We are more fortunate in being able to anticipate from past experience that direct savings will accrue from conversion here, but the author evidently regards such savings as of secondary importance in relation to the indirect advantages of electrification. One of the most striking of these is the high value of the sites over terminal stations that have been freed for the erection of commercial premises; added to the advantages of increased track mileage available, multi-unit working, and purer air in the neighbourhood, this has more than paid for the whole cost of the scheme, which is functioning just as it was intended to function. The oil-electric system, which has replaced steam locomotives on branch lines where the passenger traffic has declined, has also proved entirely successful, in spite of the high cost of the engines.

Overhauling and Load Factor

AT this season of the year when there are no peaks due to the power and lighting overlap, engineers with power stations running at the average load factor of thirty per cent. or less can overhaul their generating plant free from any anxiety. Their stand-by capacity is probably equivalent to the maximum continuous rating of the largest set in order to cope with emergencies on the winter peak; the fall in load in the summer enables them to carry as much spare during overhaul. What would be the effect of connecting a consumer with a load factor of from 70 to 100 per cent.? This would depend upon the relative proportions of the new and existing demands. If the added load formed an appreciable proportion of the total, as it might if the station were a small isolated one, it would probably necessitate the installation of further plant to provide a margin for the overhauling period that would be unnecessary at the existing load factor. The new load would have to be debited with higher kW charges than the old, and it might not prove so great a boon to a smaller station as it would to a larger one, even if the normal costs were no higher.

A Plea from New Zealand

A CORRESPONDENT holding an important position in New Zealand draws our attention to a matter in which those living in distant parts of the Empire are at a disadvantage. He says that the ELECTRICAL REVIEW takes about six weeks to reach him and by then the time for sending in applications for appointments advertised in our pages has lapsed. He mentions three instances in which he considers he would have been a suitable applicant. We realise that advertisers often require a man at short notice, but there must be many cases in which a longer period could be allowed. At all events, we have pleasure in airing our correspondent's grievance.

The Middlesbrough Relay Scheme

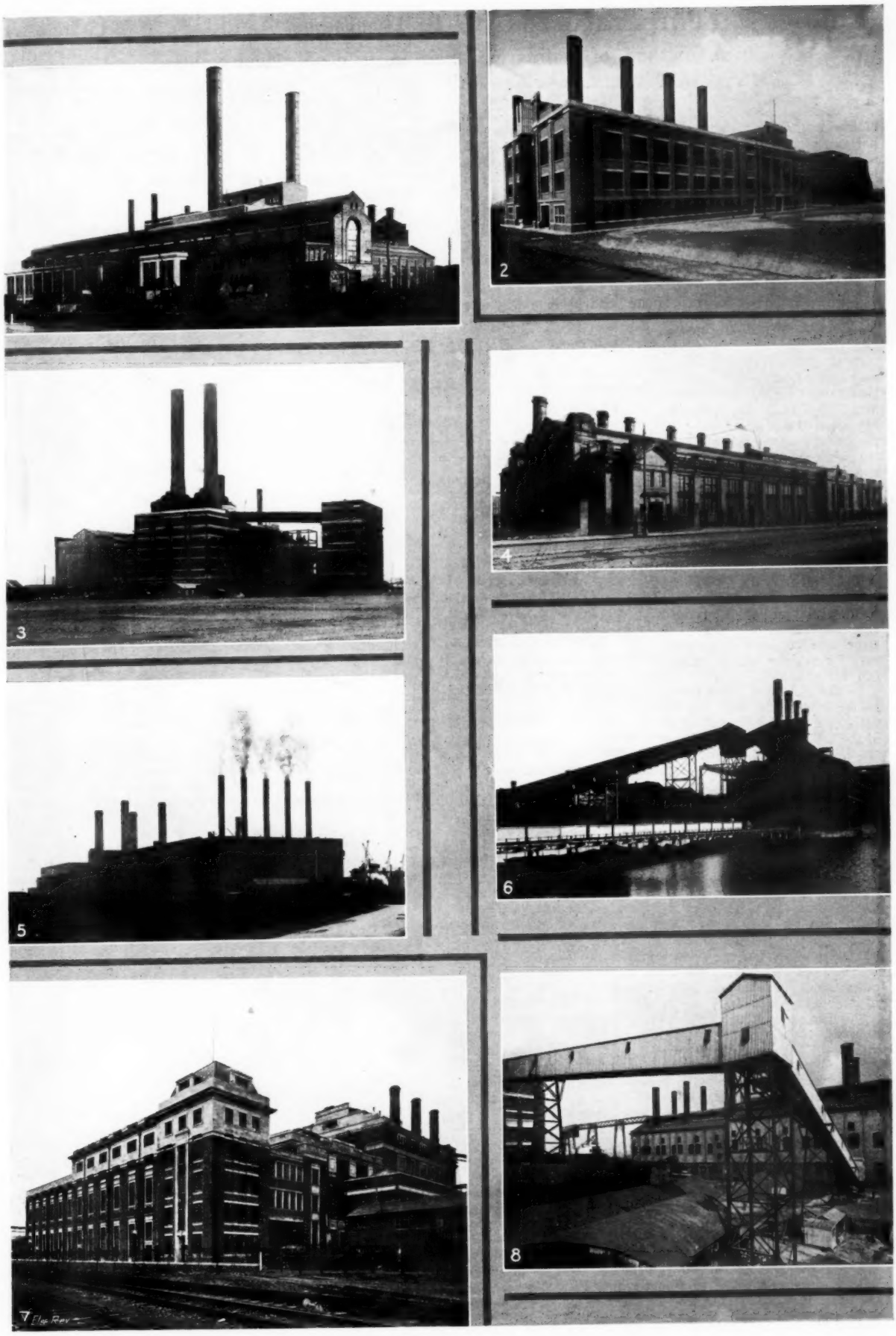
BY instructing the Committee which is to consider the Middlesbrough Corporation's Bill to cut out the part relating to the operation of a broadcast relay service, the House of Commons has stopped what would have been an interesting experiment. It was the Corporation's intention to employ its electric lighting circuits for the purpose, which we would have thought preferable to the installation of an entirely new system, with its attendant complications. There is evidently a demand for such a service, for there are already 100,000 subscribers to the various local relay systems, but although the Postmaster-General raised no objections to the Middlesbrough proposal the Corporation is not to be allowed to proceed with it.

Still Advancing

ALTHOUGH Birmingham is mainly an industrial centre, and in spite of the trade depression, the Corporation's electricity undertaking made excellent progress during the past financial year. The sales of energy advanced by nearly 12 per cent., but the revenue by only 4½ per cent., due to substantial reductions in charges. During the last five years Birmingham has increased its annual sales by 55 per cent., while the aggregate quantity of consumers' apparatus taking supply has advanced by 79 per cent.—an excellent record.

Quite Unofficial

THERE is much to be said for the exercise by members of the Institution of Electrical Engineers of their privilege to put forward the names of candidates for election to the Council as an alternative to the Council's own list. We do think, however, that it was a mistake on the part of the supporters of one of this year's unofficial candidates to have allowed the name and address of the Institution to appear at the head of his circular. Many recipients interpretated this as implying some kind of official backing, and have expressed their annoyance in consequence, but we trust that they reviewed the qualifications of the various candidates on their own merits and were not unduly influenced by a tactical error.



Some of the Stations Mentioned in the Electricity Commissioners' Fuel Returns (see page 14)

1. Thornhill (Yorkshire E.P. Co.). 2. Chadderton (Oldham Corporation). 3. Brimsdown "B" (Northmet Co.). 4. Portobello (Edinburgh Corporation). 5. Barking (London Power Co.). 6. Clarence Dock (Liverpool Corporation). 7. Portishead (Bristol Corporation). 8. Deptford East (London Power Co.)

Flue-gas Temperatures.

By R. Livingstone, A.M.I.E.E., A.M.I.Mech.E.

A method of estimating their most economical values

IN the design of a new power station the most economical exit flue-gas temperature, having regard to the cost of fuel and capital charges, is determined by a comparison of the sum of capital charges and fuel costs for various proportions of boiler, economiser, and air heater surfaces. Such a comparison requires the collaboration of the manufacturers of the stoker, boiler, economiser, and air heater, as all of these items are affected to some extent by a change in the final gas temperature. The exit gas temperature and value of CO_2 both vary with the load on the boiler, and the proportional flue-gas loss is not constant for varying load conditions. As the utilisation factor of the boilers can only be approximated, it is customary to assume, when estimating the annual cost of fuel, that the percentage of flue-gas loss at the normal economic rating and with average CO_2 is a constant and that the annual loss is proportional to this figure and to the boiler utilisation factor.

As the actual variation in coal consumption with change in air heater or economiser surface may differ from the estimated variation, the determination of the most economical exit gas temperature can only be an approximation and any assumptions are justified which simplify the problem without introducing errors of appreciable magnitude. Such an approximate method is given by the accompanying chart by means of which the economical value of the economiser surface for a given flue-gas exit temperature can be determined and conversely, by trial and error, the economical temperature for a given cost of surface can be obtained.

To use the chart, when no air heater is installed, work out the value of k^1 for the normal values of the various constants. From the intersection of the value of *l.c.* and the "no heater" line draw a horizontal line to intersect the value of k^1, and at this point the value of b_e/r_e can be read on the top scale. When an air heater is used, the value of k must also be determined. From the intersection of *l.c.* and k draw a horizontal line to cut the value of k^1, and from this point read the value of b_e/r_e on the top scale.

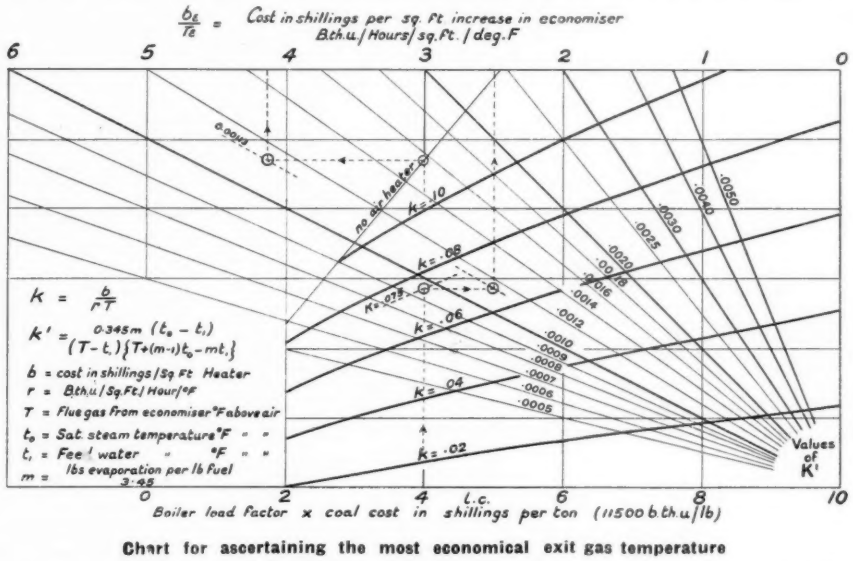


Chart for ascertaining the most economical exit gas temperature

Variation in Heating Surface

In constructing the chart, the amount of air preheating and size of heater are taken at the most economical values as given in a previous article,* and the small variation in the cost of the boiler consequent on the change in combustion-air temperature is taken at an average value of 9d. per lb. of fuel at n.e.r. per 100 deg. F. variation in air temperature. This value varies between one boiler and another, but the effect of this is so small that an average value can be taken.

It is further assumed that, for a given feed water temperature and amount of air heating, the change in boiler heating surface up to the point where superheating and evaporation ends and water heating begins is negligible with change in exit gas temperature, and that the evaporation per lb. of fuel is constant. The variation in water-heating surface is then estimated for a drop in flue-gas temperature of 1 deg. F. per 3.45 B.th.U. absorbed by the feed water. The change in heating surface as estimated in this way for a variation in exit gas temperature gives a slightly greater rate of exchange than is actually necessary for water heating alone—especially when some of this surface is situated in the furnace walls—but is less than the rate of change for the total evaporating and water-heating surfaces.

On the other hand, the stoker and combustion space—with constant combustion temperature—is increased slightly, although the heating surface is reduced. This is taken as balancing the underestimate of change in total heating surface and as justification for confining attention to the water-heating surface situated at the flue-gas exit.

The annual capital charges are taken as 10 per cent. of the cost of the boiler and 12 per cent. of the cost of the heater. The installation of an air heater adds to the annual maintenance charges and to the power consumption of the fans. Part of the increase in annual cost is a constant, part proportional to the operating hours, and part proportional to the annual coal consumption; the most convenient method of allowing for the additional cleaning and fan power is by the overall figure of 2 per cent. of the capital cost per annum.

Radiation and Combustion Losses

The radiation and combustion losses at n.e.r. are assumed to be constant and the average value of CO_2 is taken as 12 per cent. The combustion efficiency may be improved by the increase in air temperature consequent on increased exit gas temperatures; but, as the combustion losses without any air heating are only about 2 per cent., any slight variation due to a small change in air temperature is negligible. The rate of change in coal consumption with change in exit gas temperature is therefore the same as the rate of change in the flue-gas losses—3.45 B.th.U., or 0.03 per cent. per deg. F.

To show how the economical exit gas temperature varies with the feed water temperature, with and without an air heater, the following figures have been taken as representing average values: air temperature, 80 deg. F.; *l*, 0.375; *c*, 13s. 4d.; b/r, 1.6; b_e/r_e, 2.8; *m*, 2.32; t_o, 370 deg. F.

The economical flue-gas temperatures as obtained from the chart by trial and error are as given in the table below:—

Total Feed Water Temperature °F.	Total Flue-gas Temperature leaving Economiser. No Air Heater °F.	Total Flue-gas Temperature leaving Economiser. With Air Heater °F.	Total Flue-gas Temperature leaving Air Heater °F.	Rise in Air Temperature °F.
180	367	520	300	240
200	385	540	305	255
225	405	560	310	275
250	425	575	315	290
275	443	590	320	300
300	460	600	320	306

For any one installation the value of *m* depends on the feed water temperature and is only assumed to be constant for each individual feed temperature for the purpose of determining the economical gas temperature at that feed water temperature.

While it would appear that a final gas temperature of less than 300 deg. F. is not economical under to-day's average conditions, progress in the design of economisers and air heaters may increase the rate of heat transmission without increase of cost and make possible the figure of 212 deg. F. which is the aim of many engineers.

*ELECTRICAL REVIEW, April 21st, page 558.

A Long Run

Mr. F. Hope-Jones, M.I.E.E., F.R.A.S., says that there are three free pendulum clocks at the Greenwich Observatory. Two of them have been stopped occasionally, as circumstances required, but the third, Shortt clock No. 11, has run continuously since its installation in 1926. This speaks well for the Synchronome "switch" embodied in the clock. A gravity lever falling with the pendulum and replaced by a magnet seven million times in the case of the half-minute, and 110 million times in the case of the two-seconds switch must surely constitute a record for any electro-mechanical apparatus.

Lightening the Domestic Burden. By Nina Dyson Rayner

ELECTRICITY has certainly been the means of eliminating drudgery in the home, and in this particular sphere women can be valuable publicity agents. If an intelligent and capable woman is given the opportunity, she can be of great service to any supply authority or firm, besides being most helpful to the housewife. Few women have the time or inclination to visit showrooms, where there is little privacy in which to discuss their particular problems; also, in large cities, where domestic users live mostly in the suburbs, one central " viewing ground " is inadequate.

By visiting the consumer in her own home, it is possible to understand her needs, financial position and tastes, and offer her practical suggestions for the easier running of her house. Those who already know the joys and advantages of electricity are easily persuaded to install a few additional appliances.

The handy " baby " cooker

A knowledge of decorative schemes, in which electrical fittings and lamps play such an important part, comes naturally to some women, and, consequently, their advice will be eagerly sought by many.

Sympathy and understanding are most necessary in furthering any industry connected with the home, and that is why, in some respects, women make more headway with consumers than men. They realise the difficulties with which housewives have to contend; they realise, also, that at the present time few women know how to get the best results from various domestic electrical appliances, and must gradually be instructed in non-technical language. Many a potential user will think that she cannot afford to have additional accessories, but, probably, she has never reckoned the money which she lays out, weekly, monthly, or quarterly, for alternative means. In this electrical age, there is available to all a splendid selection of requirements for the home from quite a moderate figure, all constructed on scientific principles by makers of repute.

Tact and Discretion

The interviewer should have the initiative to read the consumer's mind, and grasp the opportune moment to put her at ease on any point which appears to be doubtful. Great tact may be needed to convince some women that there is no danger from shock with up-to-date appliances; although we, who have used electricity for many years, fully appreciate this, our enthusiasm must not run away with us, and much patience must be exercised to make the consumer really feel that she would greatly benefit by installing various labour-saving devices.

The " all-in " tariff is to be preferred even for lighting only, as the fixed charge plus the small amount paid for lighting units will usually be approximately the same as the flat-rate for lighting only, and the supply is available for later developments if required. Electric lighting offers great possibilities in schemes for interior decoration. Simplicity should be the keynote and all unnecessary ornamentation avoided.

Mrs. Dyson Rayner is a member of the E.A.W.

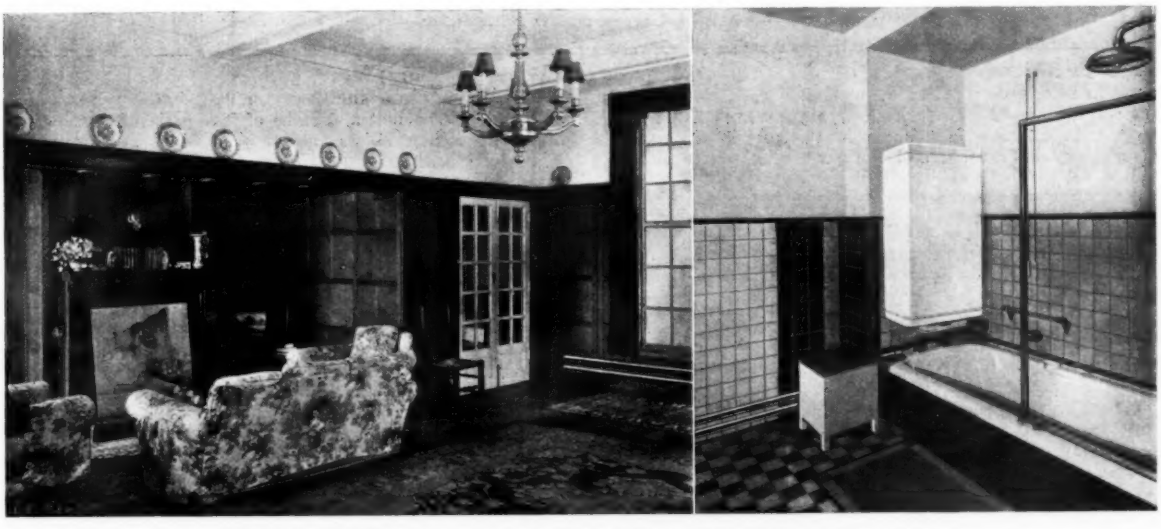
Each wall socket should be controlled by a switch, preferably with an interlocking device which prevents the plug being withdrawn from the socket before the current has been switched off. In the kitchen, scullery, larder, and wherever there is a stone or concrete floor lampholders should be made of insulating material, and switches, unless made of such material, must be earthed.

The Choice of a Cooker

When buying or hiring an electric cooker one important point to consider is the actual cooking space available. For instance, when a large joint or turkey is cooked the entire width and depth of the oven is needed to accommodate the roasting tin; consequently, I think (as a result of eight years' experience) that an oven with " top and bottom " heat is better than one with side heat only. The former type of heating gives a very even temperature all over the oven, and pastry, bread and cakes are cooked a lovely golden brown with no danger of their being burnt or cooked unevenly owing to excessive side heat. Once this operation has been carried out it can be repeated with an absolute certainty of perfect results.

Some manufacturers inform us that the " top and bottom " heat oven requires the simplest wiring and lends itself best to heat control; with this statement I am inclined to agree as the heat is placed exactly where it is most needed. A very low temperature can be obtained by switching the bottom element to the " low " position. With a little organisation and forethought, the oven can be filled to capacity at each baking, thus ensuring the maximum efficiency from a minimum consumption of electricity.

The larger type of cookers are provided with two hot plates and a grill, each having a three-heat switch. It is of great importance to explain thoroughly and carefully to the consumer how food can be brought to boiling point quickly with the switch in the " full " position. The electric kettle should always be used to boil any water required and the pan filled



Left: An attractive lounge with tubular heating. Right: The modern bathroom

Some Driving Forces in the Industry: S. Bill & Co., Ltd.

1. Mr. A. W. Zelley, representative and agent, London. 2. Mr. W. Betts, experimental department. 3. Mr. W. H. Smith, representative and agent, Manchester. 4. Mr. C. Baker, assistant sales manager. 5. Mr. R. A. Bill, sales manager and director. 6. Mr. R. W. Bill, managing director. 7. Mr. H. R. S. Heath, manager. 8. Mr. H. H. Pollard, representative and agent, Manchester. 9. Mr. L. Bridgewood, representative and agent, Yorkshire. 10. Mr. G. D. Chapman, sales representative and agent, West of England.

Lightening the Domestic Burden (*continued from previous page*)

from this before being placed on to the hot plate. For cooking potatoes, greens, &c. (which usually take from twenty to thirty minutes) when the liquid in the pan is boiling, the current may be cut off, and they will continue to simmer

"As woman to woman"

until cooked by the heat which is retained in the hot plate. All utensils must be of the really flat-bottom type, otherwise proper contact is not made. Multiple steamers are economical as a complete meal may be cooked on a single hotplate.

A "baby" cooker, which can be placed on any table, is suitable for use in a kitchenette or flat. There is a considerable saving in weight and value of food cooked in an electric oven as it retains all its natural juices; in fact, as much as 10 per cent. can be saved on a joint weighing 6 lb. Furthermore, the food tastes more appetising as it has been cooked in an absolutely pure atmosphere; and, naturally, pots and pans last much longer as they are never blackened.

To ensure a supply of hot water from all the taps in the house at any hour of the day or night, I have found an automatically controlled water heater a real necessity. But for those who still desire to retain the use of the coal fire or coke stove boiler, an immersion heater can be conveniently fitted into the existing hot-water system.

Electric washers, ironers and dryers combined are the latest for home laundry work, as the one equipment does all operations from soaking to ironing, and some of the smaller models cost but a penny an hour to run. For the modest sum of 27s. 6d. I have obtained an electric wash boiler which gives every satisfaction. When a washing compound is added to the boiling water, and the automatic washing device commences to operate, a powerful circulation is set up which passes the water rapidly through the clothes, removing all dirt and saving unnecessary wear and tear.

For those who desire to carry the advantages of electrical machinery still farther, there is the dish-washing machine. The top washing-up chamber has gunmetal-casting cages for the dishes, with a special compartment for cutlery and specially designed water-jets. At the bottom are two separate tanks, each fitted with an immersion heater. The water in one tank is for washing and that in the other, for rinsing.

First-class refrigerators may be obtained on the hire-purchase system extending over two or three years. The amount saved by eliminating food wastage goes a long way towards the quarterly payments.

The illustrations in this article are reproduced from photographs supplied by Messrs. Belling & Co. and Barker, Young & Co., Ltd.

The E.C.A. and its allied associations are gathered in force at Torquay this week for their conference. The proceedings commenced on Wednesday evening with a reception by the President (Mr. W. B. Williams) at the Medical Baths, where the meetings are being held. On Thursday, after the annual meeting and the customary civic welcome, Mr. Williams delivered his address, and in the afternoon Mr. T. C. Gilbert read a paper on his special subject—earthing. The evening was devoted to a smoking concert. To-day (Friday) Mr. J. T. Randall is talking on, and demonstrating, luminous discharge tubes, and the new President (Mr. J. Orringe) is to deliver a short address. This afternoon a garden party is being held at Tor Abbey and the delegates have been invited by the Mayor of Torquay to a ball and supper at the Town Hall this evening.

The Aims of the Association

Presidential Address by Mr. W. B. Williams

TO what extent is the E.C.A. recognised, and in what direction can its work be improved and developed? The Association includes some 1,343 unpaid representatives who are continuously endeavouring to obtain orders for the goods of the manufacturer and the wholesaler. That the contractor receives a trade discount in return for his salesmanship is only partly true, because the trade discount is given away far too frequently to the so-called "trade user."

Mr. W. B. Williams (Bristol) President of the E.C.A., 1932-33

The interests of manufacturers and wholesalers can best be served by supporting the Association wholeheartedly and by co-operating in every possible way in order to secure fair and equitable trading conditions. E.C.A. members have also rendered very great assistance to the supply side. They have been the unpaid canvassers of electricity supply, and they have assisted to load the mains and to make extensions possible.

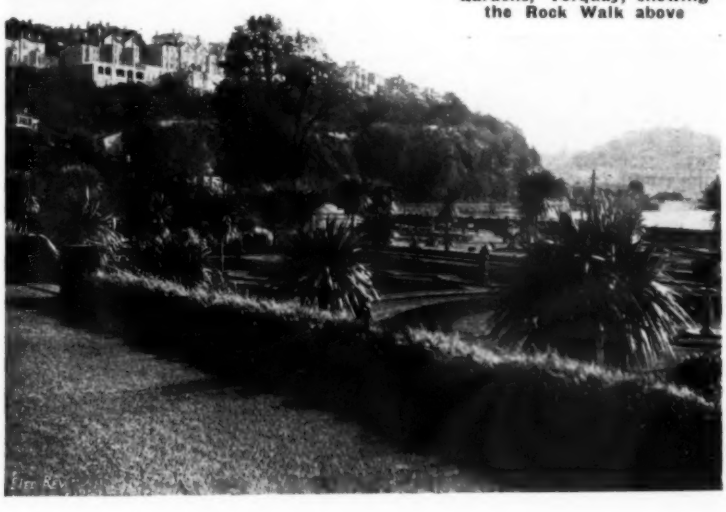
A paragraph in an electrical trade paper some few weeks ago suggested that the hired appliance was a revenue producer, and therefore the hiring rate must be low, "possibly unremunerative as a hiring transaction, but made remunerative by sharing the profit on the sale of electrical energy." This was not fair trading, nor in the interest of the electrical industry. It certainly cannot be a part of E.C.A. policy. It puts an important section of the industry, that is carrying out hire transactions to-day on an equitable basis, in an impossible position. It makes the consumer who pays for his appliance pay for those who do not, and tends to make the price per kWh higher. I have never heard or seen it suggested that any other article or appliance should be hired at a loss, and I fail to see either the necessity or wisdom of supplying anything electrical on unremunerative terms.

What is required to-day is a simple tariff and an economic price per kWh. Those are the things required to increase the consumption of electrical energy at the present moment. There is no need to take away the opportunity for business from unpaid contractor canvassers by uneconomic price-cutting. Association members were responsible in a great measure for laying the foundation of the public supplies now existing up and down the country. They canvassed and obtained consumers for many years, and their present reward, in some places, amounts to nothing more than unfair competition, installation work being carried out at a loss which is covered up by the price charged for energy. Unity of purpose between the supply side and the contractor would give added strength to the push for increased output.

The measure of assistance given to the electrical contractor by the Association is to a large extent dependent upon whether he is imbued with the spirit of "service" or the spirit of "self." It is an acknowledged principle of business that you must give satisfaction if you want to make sound progress, and the Association encourages good workmanship in every way.

The Association is an incorporated body, a definite legal entity, and therefore in its representative capacity is fully competent to conduct negotiations and to make agreements with municipalities and others. It requires at least two parties to make an agreement, and no agreement can remain in effect if differences exist between the parties concerned. Hence

A view from the Municipal Gardens, Torquay, showing the Rock Walk above



the Association cannot maintain prices that are excessive against the will of the other party, and for this reason I fail to understand how the charge of being a trade ring can be maintained. I have for many years been an ardent believer in mutual co-operation and have stressed the point whenever and wherever the opportunity served. I am convinced that the path of progress lies in the direction of the policy enunciated by "Committee D."

What is most needed to-day is a federation of the electrical industry, into which will be gathered the various sections, and with one object only in view, namely, co-operation within the industry to secure the greatest possible progress, with fair and equitable conditions, at the very minimum of cost consistent with the provision of an equitable and just return on labour and capital. Healthy competition is good and tends to improvement; but the ridiculous cutting of prices which is rampant to-day is not competition, but simply gambling against loss, a proposition which very rarely succeeds in business.

I appeal to all sections to get together in a true spirit of mutual co-operation, and with a determination to work in the best interests of all concerned.

The Annual Report

IN his report for the past year Mr. W. B. Williams said that at the commencement of his year of office it was decided to vary to some extent the manner in which the executive work of the Association was carried on, involving the abolition of eight committees and the setting up of an "Executive Committee" to deal, under the general control of the Council, with all matters affecting the Association. The object of the new arrangement was to speed up the work of the Association and avoid unnecessary delays, and the results had amply justified the experiment.

Mr. J. Orringe (Leicester), the new President of the E.C.A.

At the commencement of the year there were 1,308 members, 109 having been enrolled during the year; the present membership was 1,343, a net increase of thirty-five. During the year sub-branches of the Association were formed at Worthing and Maidstone; it was the policy of the Council to inaugurate branches wherever sufficient members were found. It had been decided to endeavour to establish a closer link between the executive of the Association and the members generally. This was being accomplished by the "Bulletin," five issues of which had been circulated, as a means of distributing confidential information.

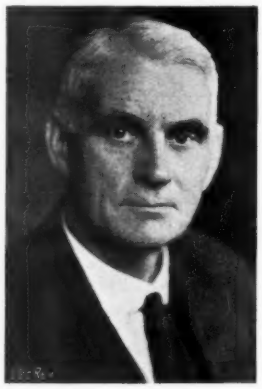
The usual conference between the Council and the National Register of Electrical Installation Contractors had not been held, due chiefly to considerations that had necessitated the Council consulting its branch organisations throughout the country. As a result of the information obtained, the basis of a discussion with the N.R.E.I.C. had been formulated and a meeting would take place between the two bodies in the very near future.

The subject of guaranteeing the work of members had received consideration by the Council and had been discussed by the branches up and down the country. The arrangement provided that, in the event of assisted wiring work being carried out by its members, the E.C.A. would guarantee the proper performance of the contract.

The Association had considered schemes by which it could offer facilities to its members to finance hire-purchase transactions on the best possible terms. A large amount of the country's business was being dealt with upon these lines, and members should not wait to be asked for hire-purchase facilities, but offer them as a matter of course.

The E.C.A. has issued its own specification for cast-iron boxes, since the British Standards Institution was not able to provide one.

He regretted that no formal report on "Committee D" had been published or was available for discussion at the meeting. He believed, however, that the long-awaited official report would be available in the very near future. A national declaration of trading policy covering the entire industry was a matter of vital importance. Several joint meetings had been held between representatives of N.E.C.T.A. and the C.M.A. It was vitally necessary to establish the principle that purchasers for their own use should not buy at the same price, quantity for quantity, as was enjoyed by those who purchased for resale. From the joint meetings in question various revisions to the agreement had been put forward by both sides, and these were now under consideration.



[*Elliott & Fry*

Mr. H. J. Cash, Vice-President of the Association

Negotiations had been carried on with E.L.M.A., and an announcement would be made at the earliest possible opportunity. The good relations which had always existed between the Electrical Trades Union and the N.F.E.A. had been maintained. Attention had been devoted to the adoption of national working rules to replace the varied arrangements operating in different parts of the country; to the abolition of anomalies which had been revealed since the introduction of the original scheme of grading; and to conditions affecting the employment of apprentices.

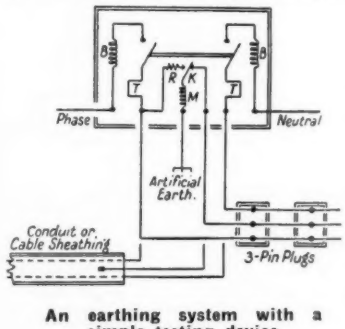
Earthing or Artificial Earthing. By T. C. Gilbert, A.M.I.E.E.

THE underlying idea of protective earthing is sound, and the organised opposition to its complete application is inspired rather by its failure in practice than by any desire to remove it from the list of protective measures.

Present earthing practice is objectionable because it cannot be universally applied or relied upon, as real maintenance demands almost expert care and continuous supervision. Artificial earthing is the protective system of the future. It need cause no drastic revision of wiring practice in this country, and it will overcome many of the objections to solid earthing, which cannot isolate a leakage in the embryo stage. Heavy fault current must flow, involving overheating and serious fire risk, before isolation can take place. With artificial earthing the leakage current is limited to about 30 mA; no matter how large the installation, sub-circuit, or single appliance, this value will secure isolation.

The complete earth circuit and the simple leakage switch mechanism can be easily tested by a key provided for that purpose, as shown in the accompanying diagram, which shows a house service box incorporating overload releases in addition to leakage trips; B B represent the magnetic blow-out coils, T T the thermal overload releases, R the testing resistance, M the trip coil, and K the test key. In the purely leakage switch the thermal overload releases and the magnetic blow-out coils are omitted, but the leakage release remains as shown in the diagram. When the test key is pressed, the apparatus is disconnected from the earth wire.

The diagram also shows alternative methods of protection, that on the left employing the conduit or cable sheathing and that on the right a small protective wire connected to the earth terminals of connected apparatus, independently of the conduit or cable sheath; the second method is preferable.



An earthing system with a simple testing device

In some cases the test is automatically applied during the normal use of the device, as in the case of one type of small switch-plug. The placing of the switch handle to the "off" position actually makes the earth test, as the test key and operating lever are combined in the one handle. It is impossible for an operator used to the normal operation of this handle not to recognise immediate trouble in the earth circuit, as the warning is unmistakeable.

With artificial earthing all protective conductors can be as small as is compatible with mechanical strength, while resistance and current-carrying capacity need not be considered.

It is completely independent of the circuit fuses, and no amount of over-fusing can vitiate the efficiency of this protection. Conversely, the fuses can be only just large enough to support the load, and the circuit may be isolated by an earth fault without disturbing the fuses.

[*Elliott & Fry*

Mr. T. C. Gilbert is an authority on the subject of earthing which he has dealt with in our pages from time to time

The persistence of an earth current over a high-resistance electrode results in a high potential upon the whole earth circuit and connected apparatus, and this fact has caused hundreds of accidents to human beings and cattle on rural installations abroad. The present earthing methods in rural areas are even more haphazard than they are elsewhere. Protection in rural areas is complicated by the fact that cattle and horses are extremely susceptible to low leakage potentials that would be unnoticed by human beings.

Germany has now definitely abandoned both earthing and neutralisation in the western areas, whilst the authorities in America and Canada are seriously perturbed at the constant accidents to cattle caused by solid earthing. The totality of experience is that solid earthing must be definitely barred from all situations where low-resistance earth connections are not available. Only artificial earthing can solve the problem of leakage protection in rural areas. With this system it matters not whether the resistance in the earth circuit is 10 ohms, 100 ohms, or even 1,000 ohms, isolation is immediately effected when required. The fact that Germany alone has over 150,000 rural installations so protected, and that the system has been compulsorily enforced by the largest supply undertaking in Europe for the past five or six years, should indicate its extreme suitability.

The antagonistic attitude of some authorities to complete and universal earthing on the ground that the present ease of utility of much apparatus would be limited—in other words, we should have to get rid of the ubiquitous lamp-holder adaptor—is more often passive than active, but it is there, nevertheless. However much we may abhor the lamp-holder adaptor, we shall never get rid of it, except, possibly, under compulsion. With artificial earthing there is really no reason why we should discard it, as effective earthing protection can be provided. The wider adoption of the smaller appliances depends upon more and more facilities being provided for their use, and the banning of the lamp-holder adaptor would appear to be a step in the wrong direction, since there is no need to provide earth connections for *every* holder, but only for those in vulnerable situations.

Artificial earthing is, moreover, equally effective on systems with an unearthed neutral on which it is possible to receive a shock from the third phase to earth, and it must be remembered that 80 to 100 mA may be fatal to human beings, and even smaller currents may kill cattle. Again, in the case of exposed elements or live current-carrying parts there is less risk if the framework is not earthed. With artificial earthing the small isolating current and speed of disconnection combine to ensure that a shock under these conditions would be harmless.

Much time, energy, and money is spent on attempts to make the outer coverings of cables electrically continuous and of low resistance, whereas all that is required is mechanical protection for the cables. The cost and disturbance of carrying out extensions at present deters many people from the wider use of electrical appliances, so that anything that we

The Medical Baths, Torquay, at which the contractors are holding their meetings

can do towards removing this difficulty will redound to the benefit of the whole industry.

Artificial earthing will lead to the abandonment of central earthing systems and the adoption of local earthing. Further, earthing would only be applied where required, and not extended indiscriminately to all points as at present. It would always be extremely simple to convert any point from non-earthing to earthing. Easily testable local earth connections of this nature eliminate the necessity for carefully bonding conduits, and if merely mechanical protection is required the introduction of non-metallic conduits might follow, which would remove many of our present troubles. In rural areas, wiring costs would certainly be reduced as small local earth connections would provide ample protection.

Luminous Discharge-tube Lighting. By J. T. Randall, M.Sc.

THE following is a synopsis of a lecture illustrated by demonstrations. The speaker said that a discharge tube consists of a glass envelope, with perhaps a metal plate sealed into each end. If a high voltage be applied to the tube a narrow, weak, purplish discharge will flow in air at atmospheric pressure. As the air pressure is reduced the discharge expands and undergoes various transformations, but the highest luminosity is not really sufficient for any practical lighting purposes. A very useful tube of this cold cathode type is a carbon dioxide tube invented by Moore some years ago, because it gives a daylight colour which can be used for accurate colour matching. The energy consumed is 1,000 W, and the efficiency is 3 lumens per watt.

With all discharge tubes it is necessary to use a series choking device or the equivalent in the form of a magnetic leakage type transformer. By this means the current is prevented from rising to catastrophic values. Whatever other simplifications may be brought about, it does not seem likely that the current limiter will be dispensed with. Because of the presence of a choking coil in the circuit, all discharge tube circuits have low power factors, varying from 0.4 to 0.3, according to the type of tube. Whenever necessary, these can be corrected to satisfactory values by the use of condensers. The commonest gases and vapours used in cold cathode discharge tubes are neon, helium, nitrogen, mercury, carbon dioxide, and, in the "ripple" tubes, argon and organic vapours. Neon gives a bright reddish light when used in discharge tubes and helium an ivory white. Such tubes with cylindrical iron electrodes can be used to give very efficient signs for the outlining of names and buildings.

The cold cathode discharge tube usually fails owing to a "clean-up" of the gas. The gas atoms or molecules are entrapped by metal sputtered from the electrodes. As time goes on, so much gas is entrapped that the tube will no longer strike when the supply is switched on. Nevertheless, lives of several thousand hours are readily obtainable.

Mr. J. T. Randall is a member of the staff of the G.E.C. Research Laboratories, Wembley

In the hot cathode tube the cathodes (each electrode on a.c. is cathode and anode alternately) are heated externally by means of a small transformer. The cathodes may be directly heated coated wires or indirectly heated coated cylinders. When heated and exposed to the influence of an electric field, they emit a copious supply of electrons. This enables the hot cathode tube to be struck on low voltages, such as those of the ordinary supply mains.

With the sodium vapour tube very high efficiencies of upwards of 50 lumens per watt are obtainable. It is the most

efficient discharge tube made at the present time. On account of the monochromatic yellow nature of the light, it is only suitable for certain purposes, such as road lighting. It is impossible to produce in one tube all the colours necessary for white light, because the gas most easily "excited" usually dominates all others present.

A compromise between the monochromatic sodium and the low efficiency daylight tube of Moore has recently been obtained in this country. This tube is filled with a mixture of mercury and rare gases, and has an efficiency of nearly 40 lumens per watt. The light is deficient only in red, but this does not detract from its possibilities for road lighting. Whereas the discharge in all other hot cathode positive column tubes fills the tube, the light from this tube proceeds from a constricted column about six inches long.

In general, hot cathode discharge tubes require for their running a choke, a filament transformer, and a small Tesla coil for starting. It may be possible in certain cases to dispense with all but the choke. The presence of the latter, as in the case of the cold cathode tube, usually necessitates the use of condensers for correction of power factor. Finally, as the form of the hot cathode discharge tube is an innovation in lighting, much attention has to be paid to the design of housings and reflectors.

"Sunbeam" Trolley-buses

THE latest "Sunbeam" six-wheel trolley-bus chassis recently supplied to the Bournemouth Corporation has an overall length of 27 ft. 5.5 in., and a maximum width of 7 ft. 5.5 in. The turning circle is less than 60 ft., and the speed of the vehicle 30 m.p.h. The six wheels have high-pressure pneumatic tyres and "Timken" taper roller bearings, the steering gear being of the cam and roller type. Lubrication is effected on the grouped nipples system with a "Tecalemit" grease gun. In addition to electric braking a pull-on hand brake and a "Lockheed" hydraulically operated foot-pedal brake operate on common drums.

Power is transmitted from the motor to the middle axle by a short shaft with a Hardy Spicer universal joint at each end. The shaft is carefully balanced, and, because of its tubular construction, has a very high whirling speed.

The electrical equipment, which is common to both six- and four-wheel vehicles, includes a single driving motor, supplied by the British Thomson-Houston Co., Ltd., of the type B.T.-H. 201, rated at 75/80 h.p. at 500 V. It is mounted amidships in the chassis on a rigid sub-frame. This is a most accessible position and, due to the method of mounting, it is free from objectionable transmission noises. The motor is of the compound-wound type specially designed for heavy overloads, the armature being carefully balanced and running on ball and roller bearings. When braking occurs, the motor serves as a generator and returns current to the line at all speeds above 10 m.p.h. The regenerative-control equipment designed by the British Thomson-Houston Co., Ltd., consists of a master controller, a reverser, two contactor panels, and suitable main and shunt-field resistances.

The master controller is foot-operated and of simple construction, consisting of an insulated bar carrying spring contact fingers which engage successively with a double row of contacts mounted on an insulated base. The operation is direct without the use of gearing and very fine control is obtained by means of a rocking pedal plate on which the driver's foot rests.

The reverser is a small hand-operated drum controller, having three positions, "off," "forward," and "reverse." It is electrically interlocked with the contactor circuits so as to ensure that the main circuit will be opened by the contactors should the reverser be moved when under power. Contactors are used to effect control both of the main circuit and the shunt field. They consist of individual electro-magnetic switches, the operating coils of which are energised from the master controller. One panel carries the contactors for making and breaking the line circuit, also the contactors which short-circuit the sections of starting resistance. The second panel carries the contactors which short out the sections of resistance in the shunt field.

Simplicity of control is a particular feature of regenerative equipments, since a single pedal is used for acceleration and braking. Twelve control points are provided; the first five cut out steps of series resistance and the remaining seven introduce sections of resistance in the shunt field until the weakest field, corresponding to the maximum speed, is reached. Regeneration is obtained by releasing the foot and allowing the master controller to return towards the full field point, thus strengthening the shunt field, the braking effort increasing as the field is strengthened. Should the driver bring back his controller to one of the starting resistance points this will not affect regeneration, since the starting resistance, having once been shorted out, remains so until the controller is brought to the "off" position, when all the contactors open. This prevents inefficient regeneration with series resistance in circuit.

Left: A "Sunbeam" chassis and electrical equipment under test before the mounting of the coachwork. Right: One of the new Bournemouth buses. Inset: The 75-80-h.p. B.T.H. motor which is employed

A relay introduces resistance into the lamp circuit whenever a dangerous voltage rise occurs. This prevents the lamps from being burned out in the event of an interruption of the main circuit during regeneration. In order to ensure that regeneration is obtained down to a speed which makes the system worth while, it is essential for the single motor to have a wide speed range between the speed on leaving resistances and the level free-running speed of the trolley-bus. This feature also effects a considerable saving in the losses in the starting resistances. Regenerative braking can be obtained down to 11 or 12 m.p.h., thus relieving the mechanical brakes of wear to a considerable extent.

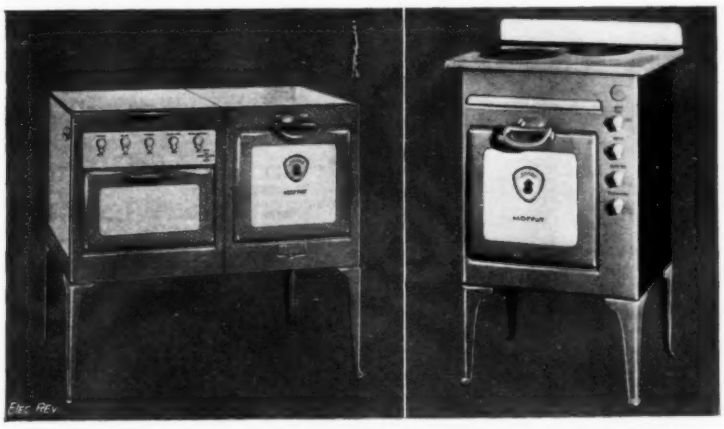
The saving in energy to be expected will vary considerably with the conditions of service, *e.g.*, number of steps per mile, gradients of route, &c. There is, however, a definite saving in any case as compared with the normal series-wound motor amounting to between 5 and 20 per cent., according to the conditions.

On the "Sunbeam" four-wheel trolley-buses, such as those supplied to the Wolverhampton Corporation, the chassis can be supplied with the motor mounted on a separate sub-frame either at the front of the chassis or amidships. The motor can be compound-wound for regeneration, or, alternatively, of the regulated field type with or without the provision of rheostatic braking.

Domestic Cooking Equipment

THE establishment by Messrs. Moffats, Ltd., of a factory at Blackburn now makes available in this country nine models of the company's domestic cookers, varying in size from No. E41 K, a "baby" type cooker with a total loading of 2,250 W, to Nos. E30 M and E36 M, each with a total loading of 8,110 W and each with four hob units and a separately heated warming cupboard.

These two larger models are of the table or horizontal type,



The E31 M table cooker with flush working surface, and the E28 M vertical cooker model

and are fitted with thermostatic oven control, the indicator and control handle for which is situated on top of the oven. No. E30 M has an oven cooking space of 18 in. by 20 in. by 13 in., and overall dimensions of 46 in. by 26¾ in. by 44¼ in. wide. The smallest cooker has a hob unit which also serves for top oven heating, and its oven, measuring 12 in. by 10¼ in. by 11 in., gives a total height to the equipment of 36¾ in. when it is mounted on the tall legs which the makers provide with this model.

Of the intermediate sizes, No. E31 M is one of the most popular models. It is of the table type but differs from the general design in that the hob top, with its lid closed, presents a top table surface flush with the oven top. A large drawer for cooking utensils is a feature of this model, which has three hob elements and 2,760 W serving 14 in. by 18¼ in. by 13 in. of oven cooking space. The hinged top, when raised, acts as a back splash plate. The table working surface (hob cover and oven top) is of acid-resisting enamel.

Except for its "colonial" drop-down door and the absence of a warming cupboard, No. E37 M probably most nearly approaches accepted English design. It has three boiling units and, standing on fairly tall legs, measures 28¼ in. by 23 in. by 39 in. Switches lined at the side of the oven are incorporated in the structure. A smaller but similar model is No. E28 M, which measures overall 14 in. by 13 in. by 3 in., and has a total loading of 4,670 W, represented by 1,700-W and 990-W hob units and top and bottom oven heating each of 990 W. Models E28 M and E37 M can be alternatively equipped with a high warming cupboard served by a separately switched element. The "Therm-o-matic" oven control is also an optional extra to model E31 M.

All the cookers are equipped with "Cookquik" boiling plates, one of the advantages of which is that the resistance coils can be easily replaced, so reducing maintenance costs. The oven elements are welded in the surfaces to afford the maximum effective cooking space.

Throughout the whole range particular attention is given to appearance. There are many attractive coloured enamel finishes, and no bolt and screw heads, &c., are visible from the outside.

Glasgow's New Railway Signals

A NEW railway signal box of the London, Midland and Scottish Railway Co. at Glasgow (St. Enoch) has some novel features. It is provided with an electric cooking appliance for the convenience of the men working in the box, which is heated by means of hot water circulated throughout the different compartments of the box. The artificial lighting is in the form of floodlighting and only provided where absolutely necessary.

On the 203-signal interlocking lever frame every lever has a repeater behind it which shows the colour of light on the signal operated by the lever, whether it is red, yellow, or green. If the signal lever also controls an indicator the illumination of the indicator is also shown. Behind the point levers there is a normal and reverse indicator. On the top of the interlocking frame there is train-describing apparatus for setting up and transmitting the description of the train. At the end of the signal box there is an indicator which shows the trains approaching St. Enoch station on the main line and on the canal line. The approach signals are operated from the boxes at Port Eglinton and Langside.

The new signal box at St. Enoch station, Glasgow

Behind the signal frame there is an illuminated diagram operated by track circuits. The running lines are shown in white and the occupation of the line is shown by two red lamps lighting on each track circuit. The installation is divided up into 170 track circuits. Each outlying signal or signal out of the signalman's sight is connected to the new cabin by means of a telephone, and the telephone switchboard is in connection with the telephone circuits that are in the immediate vicinity of St. Enoch station.

The electricity supply is taken from the Glasgow Corporation public service and from two sub-stations. A single-phase supply at 50 cycles is transformed from 250 to 110 V, and from the transformer it passes out to an automatic switchboard in three panels, one for each of the services, and the centre panel for the stand-by service, which comprises a petrol engine driving a 250-V single-phase generator. In the event of the Corporation supply failing at one station the No. 2 supply automatically drops into circuit. In the event of the second Corporation supply failing and if the No. 1 supply has not been restored, it is necessary to start up the petrol set, which is of sufficient capacity to keep the installation going until the Corporation supply is restored.

While a.c. is used for the whole of the signal lighting and the interlocking, d.c. is used for the motors, and metal rectifiers are used for the conversion of the a.c. supply for the purpose. These rectifiers are of the type which is now common in radio receivers, although of much larger capacity.

The accompanying photograph is reproduced by the courtesy of the L.M.S. Railway Co.

Power in Industry and Transport

The Stockholm meeting of the World Power Conference

THE technical session of the Sectional Meeting of the World Power Conference at Stockholm on Friday last was occupied by papers and discussions on Power and Heat Combinations (Section 2) and Transmission and Adaptation of Motive Power and Industrial Machinery (Section 6). J. P. Spangenberg described (No. 40) the steps taken to extend the heat and power generating station of the Carlsberg breweries in Copenhagen. The use of high steam pressures and temperatures has been avoided, but the economic results have justified this course.

In Section 6, H. Kind (No. 71) referred to the tendency in Germany towards individual and small-group driving in works. He pointed out that for driving the live rollers of certain types of mill acceleration alone determined the rating of a squirrel-cage motor, and submitted that the motor should be so designed that its stalling torque coincided with about 90 per cent. slip. A slight increment of the slip beyond the normal value was advantageous for loom drives, as it reduced the periodic current fluctuations and the power required. A. Palmgren (Sweden) discussed the relation between the load and life of ball bearings with a view to calculating their most economical dimensions. He put forward a formula $P=\frac{C}{\sqrt[3]{a}}$, where P was the load imposed on the bearing, a the number of reported stresses on the weakest point of the bearing, and C a (bearing) constant.

On Monday morning last there was a meeting of Section 4 (Special Energy Problems in the Iron and Steel Industry), and in the afternoon a meeting of Section 5 (Electrical Heating). Dr. C. T. Buff reviewed developments in industrial furnaces in Germany since 1930 (No. 106). In arc furnaces these had been in the directions of lighter constructions, enabling larger units to be built, and of reduced charging times. Progress in reducing furnaces had been achieved by the use of large-diameter electrodes and amorphous carbon in conjunction with new designs of holders. Coreless induction furnaces for 350 to 500 cycles had been made in larger capacities, with diminished electrical losses. Further fields of application of resistance furnaces had resulted from the use of new kinds of alloys for metallic resistors and from the improvement of silicon-carbide resistors; preliminary trials seemed to show that the problem of hard firing porcelain at high temperatures had been solved. The prospects of electric heating depended mainly on the price of energy.

Mr. W. A. Agnew, chief mechanical engineer, London Underground Railways, who is representing the group at the World Power Conference

There were about seventy electric steel furnaces in Japan, M. Nakumura stated (No. 14), in units of from 300 to 11,000 kVA. He questioned the economy of the open-hearth principle, and described the main features of a design (incorporating a deep bath) for producing basic steels by a modified double-slag method. A 3,240-kVA furnace of this type required only 500 kWh per ton for a ten-ton charge of mild steel twice a day. The price of electricity was from 0.25d. to 0.625d. per kWh, but it should not be more than 0.2d. to compete with the basic open-hearth process.

Diesel-electric Operation

Monday afternoon was devoted to considering Energy Problems of Railways (Section 7). There was only one British paper, that of A. Chorlton on behalf of the British National Committee, which was entitled "Some Notes on English Diesel-Electric Practice." He summed up the advantages of the system in comparison with steam locomotives as: (1) fuel economy; (2) low water consumption; (3) low weight of train; (4) high power at low speeds; (5) suitability of intermittent services; (6) long working hours; (7) little time out of service for fuelling, cleaning, and maintenance; (8) no boiler attendant required; (9) two or more engines or unit trains could be run in tandem with the same crew; and (10) developments for high-speed services now appearing. The relatively high capital cost was a handicap, but material reductions might be anticipated. In a Danish paper on the same subject (No. 89), P. Hansen expressed the view that the two-stroke heavy-oil engine would prove to be that which was best suited for traction. Although the number of ignitions per stroke was doubled, the stresses on bearings, valves, and crank-pin bolts were less than with the four-stroke engine.

H. Parodi (No. 102) examined the official statistics of French railways and compared the results of electric with steam traction on lines with dense traffic in order to determine the minimum traffic at which electrification became economical. The paper also contained studies of the advantages of electrification and of the relation of electric railways to other methods of transport. An examination of the costs of steam and electric traction in Italy (No. 59) has led G. Bianchi to conclude that if the traffic exceeded four million tons yearly the operating costs of steam locomotives were considerably greater than the costs of lines and sub-stations. With electrification one man, instead of two, was required on the foot-plate, maintenance charges could be reduced by building a standard type of locomotive and by concentrating repairs, and the longer run between repairs reduced the number of electric locomotives required. The cost of electricity could be reduced by using the same generating plant and lines as for industrial purposes.

Mr. D. N. Dunlop, chairman of the British National Committee of the World Power Conference

American Transport Experience

The history of recent power developments on the New Haven Railroad (New York) which S. Withington gave (No. 94) showed that even when the direct savings due to electrification were not enough to offset the expenditure the indirect advantages had fully justified it. One of the most important indirect advantages of electrification was the use of the space over the terminal stations for the erection of commercial buildings. The capitalised value of this space was over £10 million; adding a similar amount for the additional track mileage made available through double-level operation, the total credits more than offset the gross cost of the entire electrification. The elimination of smoke had also increased considerably the value of neighbouring property. The substitution of multiple-unit trains for locomotives had been one of the greatest benefits of the change, as it had reduced terminal switching. Declining passenger traffic on certain steam-operated lines had led to the introduction of thirty-eight heavy-oil engines; heavier units embodied electrical transmission. Although considerably higher in first cost than steam locomotives, they had been found to justify the expenditure when the annual mileage exceeded 30,000.

In No. 95, H. J. van Lessen gave a brief historical review of the Dutch railways. In 1918 it was decided to introduce the d.c. 1,500-V system for general electrification and to buy electricity from existing generating stations on the ground of economy. Except in the first sub-station, mercury arc rectifiers had been installed with automatic control. T. Boveri (Switzerland, No. 55) stated that it was economic to employ 50-cycle tractors, with a view to taking electricity from the general 50-cycle supply system, if their weight and price were not more than 30 per cent. above those built for 16⅔ cycles or for high-voltage d.c. In No. 77, N. Statsbauer discussed power supply to the four single-phase lines in Norway.

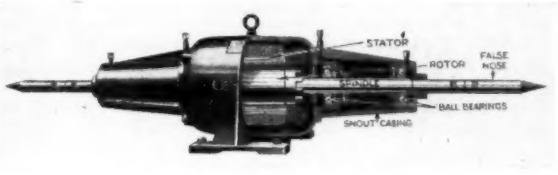
In Section 3, on Tuesday, G. Riedel described the steps taken to electrify the paper mills of Saxony (No. 21). It was decided to limit the generation of electricity at the works to the amount produced by back-pressure turbines furnishing process steam and to purchase the remainder. The total annual supply amounted to 150 million kWh. Wednesday and Thursday were occupied by tours to places of technical interest in Sweden. To-day (Friday) the delegates will proceed to Sarpsburg, in Norway, for further visits to industrial plants, afterwards motoring to Oslo. To-morrow there will be a choice of excursions in the neighbourhood, and an official banquet at 8 p.m.; for those who remain over the week-end further tours have been arranged for Sunday.

Motor Polishing Machines

METAL polishing machines, with self-contained electric motors, are known as "electric polishing motors," and are deservedly favoured in the layout of modern metal-finishing shops, as of course no shafting or belting is required, articles are polished with freedom and safety, there is no running to waste when not in use, starting up and shutting down are instantaneous, and noise is reduced to the minimum.

Electric polishing motors proper are specially designed for their purpose, ordinary industrial motors with an extended spindle having been found unsatisfactory, being weak with bearings too short. The spindles of polishing motors are of calculated strength for the purpose of carrying polishing mops and bobs when running at a high speed. They are fitted with detachable taper screwed false noses at either end, so that when the taper screw becomes worn the false nose can be removed for rethreading, or a new one fitted without dismantling the machine. In addition, clamping plates and nuts can be fitted at either or both ends of the spindle for mounting emery wheels, or bobs.

Correct speed is very important; mops should run at a surface speed of 6,000 to 9,000 ft. per minute, and felt or leather bobs, dressed with emery, at 4,000 to 5,000 ft. per minute. Where it is desired to use the polishing motor for both polishing and scratch brushing or lapping, a combined starting switch and speed-regulating resistance is fitted. When starting the handle is taken slowly over, the speed being then adjusted by bringing the handle back to the right position. The switch combines the functions of starter and regulator.



Construction of the snout-type motor

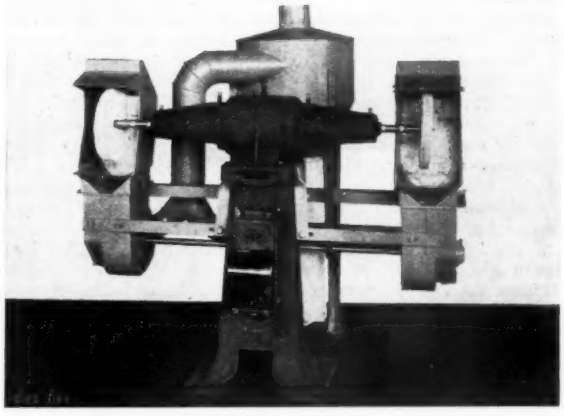
A polisher for cylindrical shapes

A good example of a specially designed polishing motor is illustrated. This machine has a snout type bearing, so-called because it carries bearings for the spindle at the extreme ends, thus strengthening the spindle to withstand the polishing load. The snout offers no more obstruction to the operator than the plain extended spindle. The motor is therefore equipped with four bearings, two on the inner shields of the motor, and two on the outer ends of the snout.

Ball bearings are fitted throughout and are specially protected against the intrusion of dust and foreign matter. The motor is totally enclosed.

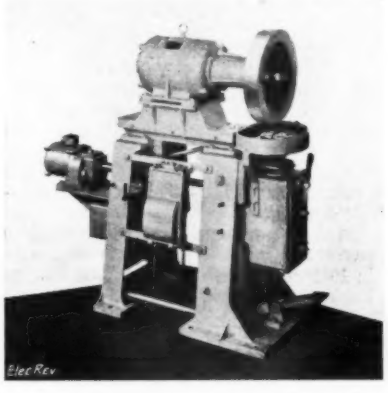
The dust exhaust is an independent unit, consisting of two partially enclosed galvanised sheet iron mop hoods, fitted with adjustable trays and cowls, and connected by the necessary trunking to a cyclone dust-collecting chamber. An independent fan is provided to each hood, and the exhaust air may be discharged with safety into the open atmosphere.

The motor drive can be enclosed in the machine casing. In the example illustrated the arrangement of the bearings in the casing is such that the spindle may be easily withdrawn after the removal of one of the overhanging bearings. The spindle is driven by multi-V belt drive from the motor, the latter being mounted on an adjustable pivot plate fitted inside the main casing. The belt tension adjustment is made by operating the hand wheels at the back of the machine to raise or lower the hinged plate carrying the motor. The starter is carried inside the main casing, and is operated by a push button. To facilitate quick and safe changing of the mops the spindle can be locked by the hand-operated plunger provided on the top of the machine. The back of the machine has a sheet-metal cover which can be easily removed to give access to the motor, starter and drive.



A snout-type machine with dust exhaust

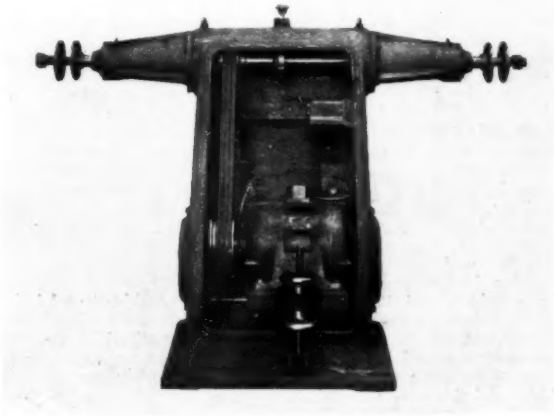
Among the automatic polishers the universal type machine claims first place. This machine is used mainly for polishing goods of cylindrical shape. It is fitted with a tilting device, the whole of the apparatus being tilted on its base to any particular angle required. The device permits the chuck spindle to be run at a different angle from the polishing spindle, and is of great value as parallel markings are easily removed by the application of a cross-grain polish. The period of polishing is governed by an automatic trip device which can be set for a predetermined polishing time. When the time trip device comes into operation the head swings away from the mop, and the chuck stops revolving, leaving the apparatus free for unloading. The apparatus is driven by one electric motor which revolves the chuck spindle; it also provides the reciprocating movement and revolves the timing wheel which controls the period of polishing.



A cycle chain-wheel polishing machine

The motor operates through self-contained reducing gears, which gave the correct speeds for these movements.

On a vertical rod and tube polishing machine, grinding or polishing is accomplished by a renewable band 6 in. wide, dressed with abrasive. This machine is direct driven by a 10-h.p. motor. It is remarkably efficient in operation, any degree of finish being obtainable by means of a suitable abrasive and adjustment of feed to suit the purpose in view. The abrasive band travels over a cushion or supporting band which presents a smooth even surface to the work. Simple ad-



Driving motor enclosed in the casing

justments are provided for tightening the band. The feed of the tube or rod through the machine is controlled by an automatic attachment.

The machine deals with rods and tubes not exceeding 2 in. diameter at speeds of 10 to 20 ft. per minute, according to the diameter and the state of rods and the finish desired.

In a motor-driven cycle chain-wheel polishing machine a totally enclosed snout bearing-type electric polishing motor carries a compress polishing wheel 18 in. in diameter. The chain wheel is held in the tray directly under the polishing wheel and is brought into contact with the latter by means of a pedal-operated raising and lowering motion. The mechanism of the latter incorporates a magnetic chuck controlled by a switching arrangement, by means of which the chuck is excited during the upward movement of the chain wheel, so that the chain wheel is held firmly for the polishing process just before it makes contact with the polishing wheel. A small totally enclosed motor with a reduction gear is mounted at the back of the machine, which provides the movement for the revolving chuck. This motor also actuates a reciprocating movement on the polishing head, by means of which the polishing wheel is made to travel across the face of the chain wheel.

The beads and insides of cycle rims are finished by a machine in which a double-ended snout type of electric polishing motor is used for carrying mops to polish the beads and insides of two rims simultaneously, and twin right and left-hand loading tables carry the rims, the latter being revolved by means of individual motors mounted at the back of the stands, correct pressure contact of rims and mops being maintained automatically.

The Fuel Returns

THE "Analyses and Summaries of the Returns of Fuel Consumption and Units Generated by Authorised Undertakers" for the year ended December 31st, 1932, have been issued by the Electricity Commission (Stationery Office, 1s. 6d). We referred to the outstanding features in our leading columns last week.

Returns were received from 521 generating stations, a decrease of seventeen from the previous year due to the permanent closing of thirty-seven stations, the starting up of four new stations, and the inclusion of sixteen previously non-statutory stations. The kWh generated, 13,656 million, represented an increase of 6.58 per cent. on the 1931 figures, and the total amount of coal, coke, and fuel oil consumed (10,174,294 tons), showed an increase of 2.49 per cent. The average fuel consumption per kWh of the 287 steam stations, which generated 13,038 million kWh (95.5 per cent. of the total), was 1.74 lb. (1.82 lb. in 1931), ranging from 1.49 lb. for the group of thirteen stations producing over 200 million kWh to 17.15 lb. for the eight stations producing less than 50 thousand kWh. The consumption shows a progressive increase for the eleven intermediate groups arranged in order of decreasing output.

The 166 oil engine stations generated 83.7 million kWh (0.59 per cent. of total) for an average of 0.82 lb. of fuel per kWh (0.87 lb. in 1931), and the twenty-five gas-producer stations 8 million kWh for 2.25 lb. (1.94 lb. in 1931). About 171 million kWh was produced in thirteen waste-heat or gas and eighteen destructor stations, one million kWh in twelve town's gas stations, and 354 million kWh (2.59 per cent. of total) in fifty-three water-power stations.

In the ten regional areas South Scotland showed the greatest increase in output—16.21 per cent. on a relatively small total in 1931 of 10.3 million kWh. Of the larger areas, in Central England the kWh generated increased by 12.6 per cent. to 1,573 million, and North Scotland showed a decline of 18 per cent. to 283 million.

The highest thermal efficiency of any station was once more shown by Buxton with 30.64 per cent. (31.68 in 1931), but its fuel consumption (0.6 lb. per kWh) was higher than that of the St. Martin's Lane station of the Charing Cross Co. (0.58 lb. and 29.6 per cent.). Both of these are oil-engine stations, and thirty-five others of the same type gave thermal efficiencies better than that of the best steam station (24.72 per cent.); Epsom, Dorking, and Yeovil exceeded 29 per cent.

At the head of the steam stations comes Clarence Dock (Liverpool Corporation) with a thermal efficiency of 24.72 per cent. Its fuel consumption was 1.17 lb. per kWh, but in this it was beaten by Portishead (Bristol Corporation) with 1.15 lb., although the thermal efficiency of the latter (21.8 per cent.) was appreciably less. Deptford West (London Power Co.) improved on the figure (24.02) by which it gained the leadership last year to 24.55 per cent., while Kearsley (Lancs E.P. Co.) with 23.71 per cent. had the same coal consumption (1.20 lb.) which gave it first place in 1931 by that reckoning. Other stations which maintained the efficiencies of over 20 per cent. recorded in 1931 were: Hams Hall (Birmingham), 22.02; Barking (County of London Co.), 23.55; Spondon (Derby and Notts Co.), 22.77; Portobello (Edinburgh), 21.04; Kirkstall (Leeds), 24.02; Deptford East (London Power Co.), 20.28; Barton (Manchester), 22.02; North Tees (North-Eastern E.S. Co.), 22.65; Brimsdown B (Northmet), 21.08; Chadderton (Oldham), 20.29; Bonnybridge (Scottish Central E.P. Co.), 21.8; Hartshead (Stalybridge Electricity Board), 21.29; and Ferrybridge (Y.E.P. Co.), 22.55. The most notable improvement in this list is that of Kirkstall, the efficiency of which in 1931 was 21.95 per cent., the present figure indicating that the tuning-in period is past.

Newcomers to the list are Longford (Coventry), 20.15; Southwick (Brighton), 20.39; Lots Road (London Electric Railway), 20.72; Willesden (London Power Co.), 20.26; and Thornhill (Y.E.P. Co.), 20.05 (13.69 in 1931).

London's Electricity Supply

A SIXTH volume of the "Electricity Supply Return" for the London and Home Counties District has been issued (London and Home Counties Joint Electricity Authority, 5s.) The period covered ended on March 31st, 1932, for municipalities, and December 31st, 1931, for companies. The area of the District—1,797 square miles—includes the counties of London and Middlesex, and parts of Herts, Essex, Kent, Surrey, Bucks, and Berks. The 1931 population was 9,082,768.

The kWh sold by the eighty-seven undertakings was more than one-fifth of the total for Great Britain. The total capacity of the fifty-three generating stations in operation was 1,786,679 kW (1,782,041 kW in 1930-31), of which 1,607,920 kW was installed in twenty-five selected stations. Some 39 per cent. of the plant was in the twenty-nine stations of the forty-four municipalities, and 60.6 per cent. in the twenty stations of forty-two companies. The Joint Electricity Authority also operated four stations with total plant of 7,190 kW. The generating plant capacity included 46,892 kW of d.c. machines. The rated capacity of the boilers from and at 212 deg. F. was 19½ million lb. per hour.

The aggregate maximum load was 1,586,738 kW (1,518,419 kW in 1930-31), including 497,880 kW of purchased bulk supply. The kWh generated by authorised undertakings was 3,028 million, of which 916 million was produced by municipalities (569 million by metropolitan boroughs, and 347 million by extra-London authorities). 1,983 million by companies (1,707 million in London and 276 million outside), and 129 million by the J.E.A. The increase over the previous year was 8.4 per cent., and over 1929-30 it was 20.37 per cent.

Over 71 per cent. of the energy was generated in stations with an installed capacity exceeding 60,000 kW; the average works cost of this group was 0.215d., and the average capital charges (at 8½ per cent.) 0.228d. per kWh generated. Stations with less than 10,000 kW installed produced less than 3 per cent. of the energy, works costs averaging 0.606d. and capital charges 0.483d. per kWh. In addition, more than 990 million kWh was generated by railway and tramway authorities. The kWh generated by authorised undertakings per head of population was 333, or, including traction, 442 kWh.

The kWh sold (excluding bulk supplies to authorised undertakings in 1931-32), was 2,418 million, compared with 2,239 million in 1930-31. Sales in million kWh were apportioned as follows, percentage increases over the previous year being shown in brackets: Lighting and domestic, 1,106 (16.1); public lighting, 61 (10.6); traction, 322 (3.9); power, 929.

The total expenditure charged to capital account at the end of 1931-32 amounted to £104,463,000 (£96,730,000 for 1930-31). Of this, the municipalities had spent £37,414,000, the companies £65,445,000, and the J.E.A. £1,604,000, allocated in the following percentages: Generation, 35.3; transmission, 9; distribution, 48; hired apparatus and miscellaneous, 7.7. The total working cost of energy, including distribution and management, was 0.60d. per kWh, and for generation or purchased energy only 0.42d. The revenue in pence per kWh from the various services was: Lighting and domestic, 2.41; public lighting, 1.24; traction, 0.51; power, 0.97; bulk, 0.56. Particulars available for 90 per cent. of the total sales for lighting and domestic purposes showed that separately metered lighting supplies were sold at an average price of 3.49d. per kWh, heating and cooking at 1.06d., and lighting, heating, and cooking combined at 1.58d.

The report contains a coloured map showing the areas of the different authorities, particulars for each undertaking of statutory powers, systems of supply, plant installed, connected load, output, working expenses, financial details, and surplus, and its appropriation. A statement of charges made for all services by every undertaking at January 1st, 1933, is included as an appendix.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Reorganisation and After

Among all the pros and cons of the case regarding the reorganisation of the Electrical Development Association there are certain facts, not related to any sectional interests, which demand the immediate action of the industry as a whole. They are :—1. The advance of gas especially in street lighting in cities like London. 2. The petty jealousies and abuses within the commercial field. 3. The inane methods of advertising employed. 4. The "rot" which has crept in within the past few years, and absence of "push." 5. The necessity for a revision of personnel. 6. Too much entertaining by dinners and lunches of people in the industry and neglect of the consumer. Attention to these items would get at the root of the principal difficulties besetting electrical development to-day.

Six or seven years ago about £50,000 was voted and spent on a huge national campaign which accomplished good results in subsequent years and did not lack punch and public interest. Gradually, however, year after year since this enthusiastic effort has waned until the electrical world has become seriously and frankly concerned about using a national grid system which has cost a few millions to plan and construct. Clearly men of ability are not being used as they ought to be irrespective of influence or wealth or the highest technical knowledge.

Men, more than women, can carry the flag successfully where domestic supply is concerned—real men, not young gentlemen anxious for an easy job plus an easier motor car. Surely there are men about who can effectively meet gas competition, not over a lunch or dinner table but out and about! If it was successfully started upon a few years ago it can be restarted and carried on intensely again.

June 28th. GRID BIAS.

Will It Fit?

The increasing number of incorrect drawings and misfit details that are now being sent out for assembly purposes is remarkable. In many cases the outside engineer is obviously reluctant to criticise head office, the best method being to get the job done and split up the alteration costs. This is all very well for some home contracts, where the manufacturers complete the erection, or the risk of detection of "faking" is remote, but it must be damaging to overseas trade.

Before manufacturing ironwork details, &c., a complete model layout or assembly should be made to a reasonable scale. This should be done in a "model erection" room with a squared floor. The initial amount of consumable material would be very small. Light channel and angle iron, strip metal, small tubing and rod, millboard, nuts and bolts, &c., with a few wooden scale poles for isolators, transformer poles, and terminal assemblies, are about all that would be required. The discarded material from one model could be used in making new ones.

The production of the actual details would not take place until the model had been approved, and the benefits claimed are that by means of pinhole photography the base-work of initial working drawings could be accurately obtained or checked. There would be a reduction of incorrect overall lengths or drilling centres, faulty bending, &c., with a corresponding reduction of wasted operations at the factory and alterations on site. (The time employed cutting and redrilling heavy steelwork is enormous.)

Details with process finishes such as galvanising would remain unimpaired; clearances for cables, pipework, stays, &c., would be properly catered for; earthing connections, phase indication and plate drillings would be in the correct position upon the correct detail; and the scale details could be used as guides for production, inspection or shipping checks.

In the case of divided contracts, or production by separate factories, scale details could be exchanged on loan. During a contract "extras" or deviations called for could be at once "tried out" on the model erection and correctly placed. Controversies with customer's representatives or sub-contractors would be avoided with saving in correspondence, urgent communications, express rate conveyance of material, and possible litigation or charges of "sabotage."

Parallel with this work models of current designs of transformers, rectifiers, switchgear, &c., could be made, complete in external details, and shown at trade exhibitions, afterwards being used in the model erection room for layout design or exhibiting to visiting members of purchasing commissions. Potential customers (especially from overseas) would appreciate this and would understand that details or layouts designed from model erections would require little, if any, alteration. Where the erecting customer has not full workshop, facilities this is most important, a satisfied customer being the contractor's salesman.

When tendering for an order the models of the required apparatus could be arranged correctly on lengths of timber and a correct floor plan showing girder dimensions, girder centre lines, and cable holes forwarded. (At present, many bolt holes overlap flanges or are over the web, or else cable hole

King Feisal at the works of the Grampian Electric Supply Co., Tummel Bridge. Left to right: The Duke of Atholl, King Feisal of Iraq, and Mr. George Balfour

positions are over girders, resulting in bad cable bending.) The proper shipping sequence could also be determined from complete layouts avoiding bulky apparatus being sent out too early, and taking up valuable working room, or important smaller details being delayed to make up "economic" loads. A framework giving dimensions of the customer's building entrance or passage clearance could also be used to avoid dismantling upon arrival, any obstructing details being sent separately.

Telephone exchange work, being standardised, rarely requires much alteration, but wooden representations of line and final units, group selector bays, test desks, power boards, &c., could be cheaply made, for cable support rack design. The use of a "model erection" system for railway electrification gantry design will be obvious. JOINTER-ERECTOR.

July 3rd.

What the Public Want

The correspondence in your excellent journal regarding the education of the public is extremely interesting. I fully agree with the views expressed by Mrs. Dyson Rayner in the current issue, but I would go further and state that "personal contact" is not sufficient.

As a sales organiser in a large supply undertaking I find that personal *interest* is what is required to get the sales. This interest can be advanced to, and actually is, an art in itself; it is only by using this art, in conjunction with properly educated and highly efficient salesmen, that we can hope to gain the trade to which we are justly entitled.

London, N.15, *July 1st.* W. T. WILDMAN.

Low-voltage Synchronous Clocks

We are interested to note the correspondence regarding low-voltage synchronous clocks, as for some considerable time we have supplied clocks for different voltages. As long as eighteen months ago, the Central Electricity Board fitted an installation of 12-V synchronous clocks of our manufacture. Owing, however, to the very small demand for synchronous clocks wound for voltages other than that of the mains supply, we do not keep them in stock.

With our standard designs the working mechanism is completely enclosed in a "Bakelite" housing. It is, therefore, practically impossible for anyone to get a shock through handling. It seems, therefore, that the only advantage to be gained by supplying a low-voltage pattern is to simplify the wiring if the necessary plug points are not already available.

London, W.1, *July 4th.* SMITH'S ENGLISH CLOCKS, LTD.

Plastics: Their Electrical Applications

A wide and varied selection

THE paper read by Lt.-Col. K. G. Maxwell, M.I.E.E., at the Science Museum, South Kensington, on June 28th, in the series of lectures being given in connection with the Plastics Exhibition showed that the initial difficulty in presenting a balanced survey of the extent of application of plastics in the electrical industry was that the use of these valuable materials was in many cases hardly discernible in the finished plant and equipment. The lecturer accepted the general definition of plastics which was given at the formation of the Plastics Group of the Society of Chemical Industry, namely "synthetic and natural resins, rubber, casein, bitumen and asphalt compositions, cellulose esters and ethers, and all allied products and derivatives." These names and terms, however, hardly appeared recognisable as indicating the manufactured products as used in the electrical industry in its various branches and made directly from plastic materials

Dealing first with general examples of plant and machinery in which plastics were employed, the lecturer's series of interesting lantern slides showed, amongst other things, a turbo-alternator bar in manufacture, a 620-kVA three-phase step-up transformer (11,000/63,000 V) and a half-million-volt condenser type bushing.

A softening point tester for cellulose and other films

Mechanical and Electrical Requirements

Passing to the subject of the electrical engineer's needs, Col. Maxwell said that the first consideration was reliability. With heavy plant mechanical stresses were involved at high temperatures, normally of the order of 100 deg. C., and at all times under service conditions it was necessary for the plastic material to resist distortion or fatigue in its particular use. Thus laminated resin sheets used for segmental tooth supports had to give mechanical stability to the laminations in stator or rotor and to resist fracture or sudden impact under stresses consequent on the severest conditions of electrical service. Lengthy use at running temperatures must not cause loss of shape or shrinkage. A small, almost insignificant piece of apparatus might actually control a large generator, and therefore the whole reliability of a power station might be influenced by the performance of a small moulded article.

For the electrical engineer, the properties of plastics, one or more of which might be the essential features, included: (1) The plastic yield of a material under the influence of heat. (2) The plastic yield under the influence of stress. (3) The ability to withstand certain electrical stresses when in hot and cold condition. (4) The influence of excessive humidity on electrical strength values. (5) The effect of sudden impact. (6) The ability to withstand fire risks. (7) The ability to withstand twisting and tensile stresses. (8) The ability to withstand heat of the intensity of the electric arc. In many cases also the effect of acidity, alkalinity, or immersion in hot water or hot insulating oil had also to be known, whilst these properties had to be studied in relation to the raw materials and the same materials after lengthy service.

A definite classification of mouldings was essential, and those countries which had already adopted classification were to-day reaping the benefit. To complete the standardisation of plastics for all electrical purposes, every endeavour was being made in the laboratories of firms interested in their uses to evolve clearly defined tests which would reveal the characteristics essential for any particular use. An instance was the adoption of the carbon arc penetration tester by the E.R.A., in the draft form of the proposed B.S. Specification for non-ignitable or self-extinguishing boards. (Slides were also shown of a vertical tube impact tester for bitumen and other plastics, and a softening point tester for cellulose and other films, developed in the research laboratories of the Metropolitan-Vickers Electrical Co.)

A Temperature Classification

Broadly speaking, a general classification governing the use of plastics for electrical engineering purposes could be: (1) For normal temperature conditions—maximum 30 deg. C. (2) Moderate temperature conditions—max. 60 deg. C. (3) Hot conditions—90 deg.-120 deg. C. (4) Heat resisting mouldings —approx. 300 deg. C. (5) Flameproof—approx. 500 deg. C. (6) Arc resisting mouldings (fireproof)—red heat.

For normal conditions a variety of plastics could be selected, and selection would depend on mechanical and electrical characteristics and artistic value. For moderate temperatures, many of the plastics employing waxes, pitches, and shellacs were eliminated. Performance in this class was complicated by the consideration of stability at the maximum temperature contemplated, and softening-point figures began to call for attention. For hot conditions a scrutiny of the plastics available revealed the elimination of practically all those employing waxes, pitches, and even rubber. Some of the low-grade resins would also fail under the temperature conditions now imposed, and in consequence the designer had to use higher grade mouldings, most of which contained selected synthetic resins.

For heat-resistant mouldings the heat was generally the result of poor contact, as, for instance, the difficulty of ensuring good electrical contact in the case of a power plug. The selection of plastics for this purpose was limited almost entirely to a few of the high-grade synthetic resins specially manufactured for this purpose and incorporating a high proportion of inert filler of mica, asbestos, or possibly slate or marble powders. Flameproof mouldings were similar to arc-resisting mouldings, but were treated to give better electrical properties under humid conditions. For arc-resisting mouldings the material had to be of a nature which would not ignite or carbonise, and, if possible, which would not melt. Extensive damage could be done in a fraction of a second unless they were employed to confine the arc within the desired limits.

Summing up in accordance with the temperature classification, the lecturer then showed a slide, indicating the properties of the classified plastics, pitch and wax being used at normal temperatures for terminal blocks, &c., shellac or rubber and selected fillers at moderate temperatures for magneto distributors, synthetic resins with various fillers under hot conditions for high voltage mouldings, "Mycalex" for heat-resisting conditions for high-frequency radio, &c., treated hydraulic cement under flameproof requirements for barrier pieces, and hydraulic cement for arc chutes.

Various Types and Their Uses

The lecturer concluded by showing a schedule of the various plastics used in the electrical industry. In the natural group shellac, as a bonding varnish or in moulding mixtures, found application in paper boards, tubes, cylinder, bushings, and low-temperature mouldings; rubber was used for insulation purposes and in mixtures for moulded accumulator cells; bitumen was used in filling, impregnating and sealing compounds for coils, ironclad gear and high-voltage bushings, sealing cables, and in moulding mixtures for low-temperature terminal blocks; and wax was used for moisture protective coatings and in mixtures for the production of low-temperature mouldings.

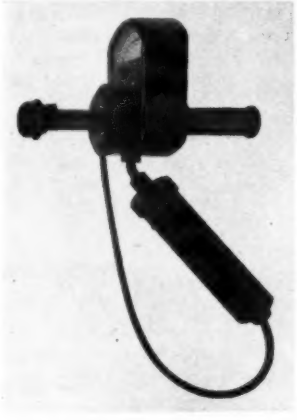
In the synthetic group phenol-formaldehyde was used as resins, treating varnishes, and moulding powders for bonded paper and boards, and for moulded insulators; urea-formaldehyde was used in varnishes and powders for transparent and opaque signs and diagram plates and instrument cases; glyptal resins and varnishes were applied in heat-resisting sheet and oil-resisting gaskets; cellulose plastics as varnish, sheet and tape, were used in motor, armature and stator coil insulation and conductor coverings; casein, as rods, sheets, and tubes, was used for insulating screws or studs, switchboard labels and cable identification rings.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Self-Contained Disappearing Filament Pyrometer

A recent development of the disappearing filament pyrometer produced by the CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1, is a self-contained model in which the battery is housed within a tubular case forming a convenient handle. A switch in the handle enables the current to be turned on or off. A standard 4.5-V torch battery is fitted with a flexible lead and a two-pin plug connector.



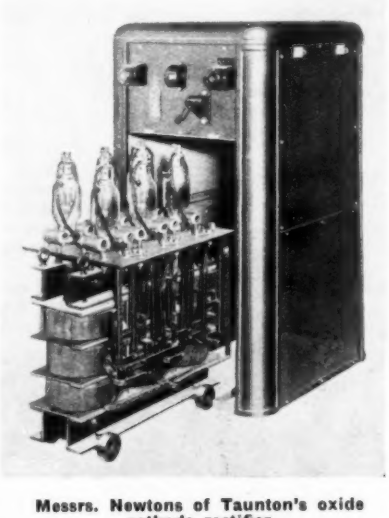
The Cambridge self-contained disappearing-filament pyrometer

The pyrometer consists essentially of an electric lamp connected in circuit with a small ammeter and a rheostat. By adjusting the rheostat the current passing through the lamp can be varied and the brightness of the lamp filament altered to match that of the hot body whose temperature is to be measured. The ammeter scale is calibrated in deg. C.

The lamp is contained within a short telescope on which the ammeter is mounted with its scale facing the observer. Standard ranges for single-scale instruments are 700 to 1,400, 900 to 1,600, and 1,100 to 1,750 deg. C., and for double-scale instruments 700 to 1,300 and 1,000 to 2,100 deg. C.

Cinema Valve Rectifiers

MESSRS. NEWTONS OF TAUNTON, LTD., 319, Regent Street, W.1, have developed their thermionic rectifier which has hitherto been used mainly for small outputs, such as are needed for battery charging, for capacities up to 150 A. It has therefore become applicable to cinema equipment in place of a motor-generator, and is also in many cases an economical alternative to mercury-arc and metal rectifiers. The enclosed truck type of construction has been adopted. The mains input transformer is air cooled, double wound, and mounted on wheels so that it can be run in and out of the cubicle. On top of the transformer is a "Paxolin" insulating baseboard on which the valves and their resistances are mounted. The controller is an automatic circuit-breaker which provides full protection.



Messrs. Newtons of Taunton's oxide cathode rectifier

For operating cinema projector arcs a "twin" output is available which consists of a transformer feeding two banks of valves. Each bank feeds one projector arc, so that during the change-over period from one projector to the other both banks are in operation. The transformer is specially designed for this duty, so that the voltage variation is very small. The ability to provide twice the rated output during the short change-over period enables one 75-A "twin" outfit to serve two 75-A arc projectors alternately.

The 70-90-V type costs £124 and the 100-110-V type £132.

A Universal Output Choke

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17, has sent us details of a new universal radio output choke specially designed for matching all makes of class "B" valves to existing loud speakers, the d.c. resistance being 400 ohms maximum.

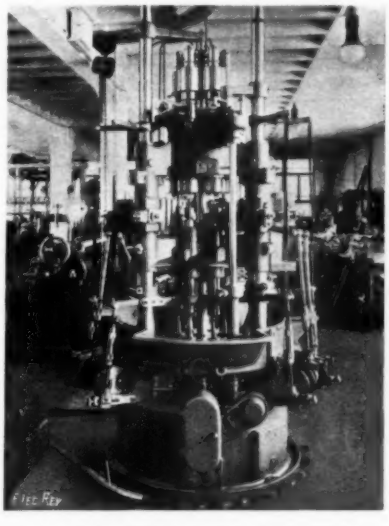
It is of the tapped type so that a suitable ratio can be obtained for all working conditions, and special care has been taken in the design to ensure maximum power efficiency and high inductance when carrying a heavy current.

Seven ratios are available—1/1, 1.6./1, 1.9/1, 1.2/1, and *vice versa*. The size is 3¼ in. by 2⅛ in. by 2 in. and the price 11s.

A Vertical Machine Tool

MESSRS. E. H. JONES (MACHINE TOOLS), LTD., Baldwin Terrace, Wharf Road, London, N.1, are introducing to the British market the "Gyromatic" six-spindle automatic machine tool. The design is based upon the use of centrifugal force, the bars from which the parts are to be made rotating in a vertical plane at a speed of about 80 ft. per second.

Made as a precision machine for variations of a.c. within plus and minus 0.0006 in. by the Tavanne Watch Co., of Switzerland, under the Schaerer patents, the "Gyromatic" embodies a large number of novel features and makes a simple and clean arrangement, as all operating elements are mounted on three columns and all tools are readily accessible and are visible during operation.



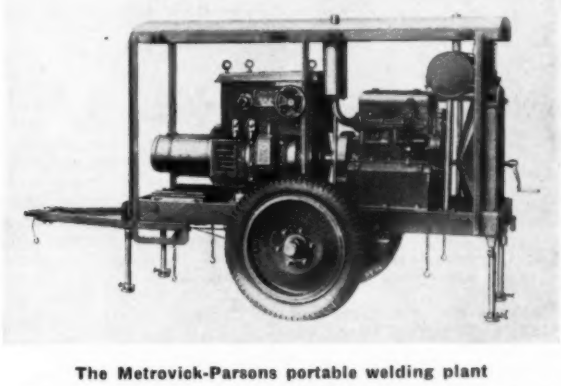
The "Gyromatic" vertical automatic machine tool

The main spindle ball bearings and collets are above the point of cut, and are thus kept free from dirt and coolant. Each of the six bottom tools has an independent feed through interchangeable cams. Eighty-five per cent. of the periphery of the cams is used for the tool feeds and fifteen per cent. for the advance and return of the tools, and the cams can be stopped during idle motions, which are rapid due to a periodically operating control shaft. Twelve or eighteen independent tools can be employed, and the one-inch capacity machine is claimed to have a net output of from 67 to 1,560 parts per hour.

The base of the 1-in. machine has a diameter of 40 in. only. All high-speed shafts and the working spindles are carried by ball and roller bearings, and the speed range is designed so that the minimum diameter of about $\frac{1}{16}$ in. can be machined at a speed of about 300 ft. and the maximum diameter at about 80 ft. per min. For aluminium speeds up to about 500 ft. are possible.

High-speed Portable Welding Plant

A high speed portable electric welding plant has recently been introduced by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.



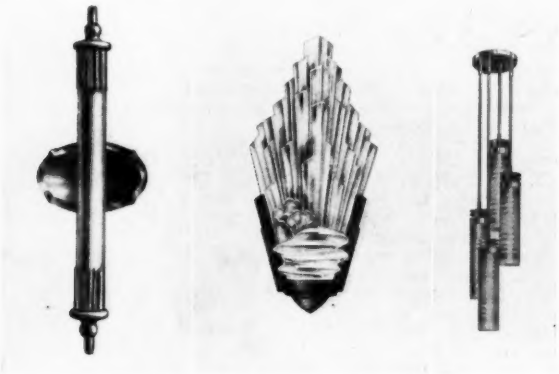
The Metrovick-Parsons portable welding plant

The plant is built up on a welded channel steel frame and mounted on sprung wheels with large pneumatic tyres. The equipment comprises a standard "D4S" 12/22-h.p. Parsons engine direct-coupled to a standard single-operator "Metrovick" welding generator.

The engine is a standard production which has been developed for industrial purposes; it is entirely enclosed, with large inspection doors giving full access to all working parts, and

it is provided with a built-in governor which controls within close limits. The top of the engine is provided with a pressed steel cover protecting sparking plugs, &c., from the weather. The water circulating plant is an integral part of the engine, and it circulates the water from the radiator at the end of the trailer, while a large fan is mounted direct on the end of the crankshaft operating in a sheet steel cowling.

The welding generator has an output of 300 A at 80/25 V and is of the self-stabilising metallic electrode arc welding type; the



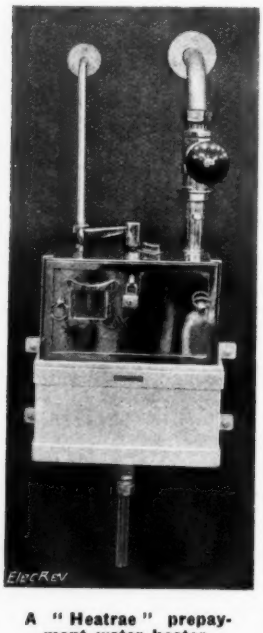
A selection of new "Ediswan" lighting fittings

plant runs at 1,440 r.p.m. Mounted in the end bracket of the generator is an exciter capable of supplying the excitation for the generator and also for providing power to drive a portable grinder. The generator control is mounted on the generator itself so that everything is self-contained, and this comprises a series diverter current regulator with a graduated dial plate, giving variations in current up to the maximum output of the set. A small field rheostat is also provided to give the variations between the steppings on the current regulator, and two outgoing arc welding terminals are provided.

The trailer is equipped with a steel roof and sheet steel sidescreens are also provided so that the plant can be entirely closed in. The plant can be readily manœuvred by hand.

Hot-water Prepayment Apparatus

The accompanying illustration shows the "Heatrae" hot-water prepayment apparatus referred to in our issue of June 16th (p. 846). It provides for a definite quantity of hot water to be obtained from a filled tank sized according to the electricity rate. It is a simple penny-in-the-slot apparatus and is installed on the hot-water side of the system. The manufacturers are ELECTRIC FIRES, LTD., Heatrae Works, Norwich.



A "Heatrae" prepayment water heater

A Crompton Potential Indicator

MESSRS. CROMPTON PARKINSON, LTD., Bush House, London, W.C.2, have just produced a new potential indicator for high voltage a.c. circuits. It is of the neon lamp type for use with series condensers. The lamp is fitted into a 4-in. dial switchboard pattern non-flanged instrument case having back terminals for panel mounting. All parts are automatically earthed immediately the lamp is withdrawn from its normal position.

The dial has a circular hole in its centre through which the disc of the lamp is visible, and also a small rectangular aperture above the centre hole through which projects an extension of the live lamp contact. A spark gap of approximately 0.75 mm. is thus formed between this extension and the edge of the rectangular aperture, and functions as an alternative indication of potential, being automatically brought into action by failure of the lamp due to open circuit.

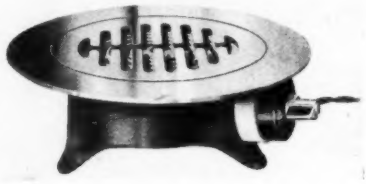
The condensers used are cylindrical. Type "A" is for use when the h.p. or e.h.p. conductor consists of round rod which can be threaded through the condenser and clamped in position by the tightening up of cone nuts. Type "B" condenser is similar, but has in addition a length of round copper rod passing through it and clamped in position by the cone nuts, for attachment to rectangular bus-bars, &c. Type "C" is for use under conditions where the h.p. or e.h.p. conductor is not required to pass through the condenser. It is similar to type "B," but the round rod projects at one end only.

The proportions of the metal plates and dielectric are such that a relatively low potential proportionate to the system voltage to earth and not exceeding a maximum of 460 V is applied to the neon lamp, causing it to glow and thus indicate that the circuit is alive. Even if the system voltage to earth falls to a value as low as 25 per cent. of normal this glow persists, but with decreased intensity.

The condensers are manufactured for pressures to earth of 6,350, 3,800 and 1,900 V respectively, and to obtain simultaneous indication on all three phases of a system a condenser and indicator for each phase must be used. An alternative is one indicator connected in turn to a condenser in each phase by a selector switch.

A Low-priced Boiling Ring

Two boiling rings recently introduced by the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, W.C.2, are 8 in. and 11¼ in. in diameter, with loadings of 1,000 W and 1,500 W, and are very similar to equipments of this type produced many years ago, but their prices are now only 14s. 6d. and 21s. (31s. with three-heat control of the 1,500-W model). The casing and legs are of cast-iron, with black-enamelled finish, and the cast-iron top plate is ground and polished. The nichrome element is arranged in spiral formation in a grooved refractory, and the internal leads are insulated by porcelain beads and are brought out to a porcelain cleat on the base plate, so that "cooking" of the flexible cable is reduced to a minimum. The larger ring is available with one- or three-heat control.



The new 1,500-W "Ediswan" boiling ring

A Wash Boiler

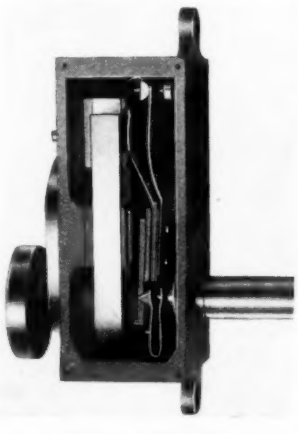
A ten-gallon wash boiler recently introduced by REVO ELECTRIC CO., LTD., Tividale, Tipton, Staffs, has been designed specially for housing schemes. Its 3.2-kW mica elements have a unique clamping arrangement to give the maximum heat transference possible, and the heavy gauge copper container is tinned inside by the company's special process.

Three art colour finishes are available, and the hard stove enamel is superimposed on the galvanised sheet exterior.

An illustration of the wash boiler appeared in our issue of June 9th (page 813).

Oven Thermostats

For controlling ovens and furnaces up to 600 deg. C. the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, has introduced the type "T1" thermostat which is operated by the use of two metals with different coefficients of expansion. Special attention has been given in choosing these two metals to avoid the effect of "creep."



An internal view of the new "T.1" thermostat

The electrical portion will deal with up to 15 A, 250 V a.c or 10 A, 250 V d.c; for higher loadings the thermostat should be used in conjunction with contactors. On d.c. circuits a small condenser must be connected in parallel with the contactor operating coil.

A magnetic blowout is fitted to the q.m. and b. switch, and the temperature overlap is 10 deg. C. The price of the thermostat head is £11 9s. 6d., and tubes are 18s. 6d. per ft., 2 ft. being provided as standard.

An Imitation Coal Fire

The imitation fuel employed in the new "King Coal" fire marketed by CARRON COMPANY, Carron, is almost as light as paper, unbreakable, and non-inflammable, besides being particularly realistic.

The fire is of sheet-iron construction and has a convenient boiling trivet. It measures 16 in. high, 13 in. wide, and 8 in. deep, and is loaded at 2 kW. Finished in art silver or art copper it costs £2 2s. 6d. There is also a 1-kW model without the top horizontal element and the trivet, that is with only the front vertical element. Both fires were illustrated in our issue of June 16th (page 845).

The Storage Battery Industry. By E. S. New, M.I.E.E.

The present position and future prospects

FEW industries have made such rapid progress in a comparatively short period as the electrical industry, and in its development that section of it concerned with storage batteries has played a pioneering and prominent part throughout its fifty years of activity. To-day, as the result of careful research and up-to-date methods of manufacture, the storage battery industry retains its important position, although the demands for its products have undergone considerable variation—in fact, a detailed description of the many uses to which storage batteries are put and their many types would make surprising reading.

Diversity of requirement, however, has not been permitted to create a multiplicity of types, and a measure of standardisation was effected in 1932 by the publication of a British Standard Specification for stationary batteries (No. 440-1932) which it is hoped consultants and others will use in order to avoid the past multiplicity of types and sizes. It is hardly likely that revolutionary changes or modifications will be seen for some time, although the highly developed research work in the industry is continually devoted to the improved performance of the storage battery. Even so, there are many patents being taken out for new designs or other improvements, but few, if any, disclose indications of any striking progress of a revolutionary kind, though many extravagant claims are continually being made—to the detriment of the industry.

The Effect of the Grid

In the days of the small stations generating direct current the storage battery was almost a necessity, enabling them to supply the night loads and to supplement the generators when heavy loads had to be met, and the major activities of the battery makers were confined to storage batteries for this purpose. Times have changed and with them the system of electricity supply. The operation of the grid has meant the closing down of the small d.c. station and the consequent elimination of the large central station battery with the exception, of course, of the few required in big sub-stations.

Nevertheless, the operation of the e.h.p. switchgear for the grid is mainly controlled by storage batteries which are used also for metering, fault detection, and remote control operations, while in the generating stations themselves batteries are used in connection with switchgear control and the operation of auxiliary services and station emergency lighting.

While in the central station field the large storage battery has suffered an eclipse, it has only been partial, for, with the decreased demand for station batteries, there is an increasing demand for storage batteries for the purpose of safety or emergency lighting, and battery installations to ensure immunity from lighting failures have been erected in large numbers of cinemas, hospitals, hotels, public buildings, stores and business houses.

Storage batteries are also installed in a large number of country houses where continuity of supply is looked upon as an essential of electrical service, and where the cost of the battery is regarded as justifiable in view of the immunity from lighting failures which it affords. There are still many country houses generating their own current and where batteries are installed as a matter of course, but insufficient attention has been drawn to the advisability of country houses going over to the mains retaining their batteries for lighting purposes and for use in the event of a mains breakdown, the batteries being charged from the mains, in a great many cases at specially reduced rates. At the same time they assist the supply companies by relieving the peak load on long-distance feeders.

The Post Office remains a very good customer of the battery industry, the large batteries used in the automatic telephone exchanges comparing in size with the departed central station type. Broadcasting, too, has made demands on the industry for large and small batteries for such purposes as reserve supplies, switching, and relay requirements, and anode and l.t. supply for transmitting valves.

Electric Vehicle Progress

The great popularity of the motor car opened up a new field for the storage battery, at the same time presenting battery makers with problems of no mean order which they have successfully overcome. Few realise what enormous demands are made on a starter battery—demands which have to be met almost hourly. The so-called remarkable demonstrations of short-circuiting to prove the superiority of this or that battery are not remarkable at all, since any good battery is constantly standing up to such a strain; a 50-Ah battery is often called upon to provide as much as ten times its rated capacity in starting up a car.

To that field has been added the electric vehicle driven by storage batteries, which, despite a marked conservatism on the part of transport users, has made slow but steady progress. The greatest activities in that direction have been among municipalities, who, having proved the suitability of the electric vehicle for refuse collection, have gone ahead building up fleets of vehicles for this purpose—Glasgow, Birmingham, Sheffield and others have large numbers of electrics in use. Other trades and industries, notably the dairy industry, have realised the hygienic value of the electric, and, notwithstanding the extra tax now imposed, there is a big field for it.

[Elliott & Fry

Mr. E. S. New is the president of the Accumulator Manufacturers' Association and joint managing director of the D.P. Battery Co., Ltd.

Continental countries are more advanced in their use of electrics; the German Postal Service, for example, has a fleet of these vessels running into thousands giving very satisfactory service. It is too early to say what effect the Salter Report will have on the industry, but one point which has not emerged as clearly as it ought to have done in the arguments for and against the increased tax is that the electric is called upon to pay for highways which it does not use, its field of operation being more or less limited to the roads which are not maintained out of the Road Fund.

On the railways, recent developments in connection with the Diesel-electric locomotive have opened up further possibilities for the supply of storage batteries which are used for starting the engine, maintaining the vacuum for the braking system, and, in some cases, providing additional power for assisting the engine to start up heavy shunts and for accelerating from stations. The three-power locomotive drawing power from the track, using a Diesel engine for branch line work and a battery for supplementary power, which has undergone satisfactory trials in America, indicates a progressive step, while increasing numbers of battery-driven locomotives are being used for mining, tunnelling and haulage. Train lighting has called for storage batteries of a specially robust type to meet the severe conditions. Larger batteries are in use for electric cooking and the latest methods of railway signalling and shunting employ storage batteries for electrical operation.

The dependence of the submarine on its huge storage battery —weighing as much as 150 tons—is well known, but in the last two or three years there has arisen a demand for storage batteries on board ship for such purposes as emergency steering, wireless signalling, fire detection, clocks, telephones, emergency lighting, and operation of the gyroscopic compass. Batteries have, of course, been used over a number of years in smaller vessels, yachts and light craft.

Large Field in Radio

Despite the view held by some that the advent of the mains-operated wireless set would remove the battery set from the market, the production and sale of wireless batteries has jumped ahead, and when it is realised that some 8,000,000 houses are without a supply of electricity and that the new "quiescent-push-pull" battery operated set gives mains volume with an anode circuit consumption of much less than that of the average three-valve set, he would be bold indeed who predicted the disappearance of the battery for wireless purposes. While dealing with the portable battery it might be mentioned that there are now about 400,000 miners' electric lamps—50 per cent. of the total number of lamps employed in mines—all of them using small storage batteries, and experiments with 6-V lamps of higher candle power than the usual safety lamp are likely to lead to greater developments. The police forces are also large users of batteries for lamps.

The Argentine Sign Market

A favourable market is stated to exist in Argentina for electric sign materials, such as incandescent and coloured lamps, copper wire, and automatic switches. The elaborate electrical illuminations in the retail shopping district of Buenos Aires are said to rival those in Europe and the United States. The manufacture of these signs has become an important industry in Buenos Aires, but the materials used are imported.

New Books

The Theory of Electricity and Magnetism. By Max Planck. Pp. 247. London: Macmillan & Co. Price 10s. 6d.

This book is the third of a set of five volumes on theoretical physics which have been written by Prof. Planck, of Berlin, and translated by Prof. H. L. Brose. The first two deal respectively with general mechanics and mechanics of deformable bodies; the volume under review depends on them in considerable measure and cannot be read properly without them. The exposition is delightfully lucid, although the treatment is essentially mathematical.

Those who have been prevented by the demands of practical life from making excursions into the realms of pure theory will be surprised to find how phenomena which they have been accustomed to regard as independent and fundamental can be deduced from two postulates, an experimental law and a few definitions. The two postulates are (a) the principle of the conservation of energy, and (b) the principle of contiguous action. The principle of contiguous action (due to Maxwell) is that "every causal action propagates itself from point to point with finite velocity through space." The two initial definitions are those of the vector of electric field strength E and magnetic field strength H. The definitions are such that the energy density in an electric field is proportional to E^2 and the energy density in a magnetic field to H^2.

The author first deduces the laws of the electromagnetic field in stationary bodies and then considers the electrostatic and magnetostatic fields and the forces on bodies in them. Next, under the title of "Quasi-Stationary Processes," he discusses phenomena occurring when bodies move in electric and magnetic fields or when these fields change. "Dynamical Processes" treats of phenomena occurring under circumstances of speed or of distance from apparatus which preclude the assumptions of quasi-stationary conditions; in this chapter come the telegraph equation and the transmission of Hertzian waves.

Prof. Planck acknowledges that other postulates might have been taken at the outset, but he claims for the principle of contiguous action that it ". . . owes its sovereign position over all others, not to its greater 'correctness,' but rather to its greater definiteness and simplicity." The translation has been very well done and the production of the book is excellent.

Principles of Radio Communication, by JOHN H. MORECROFT, assisted by A. PINTO and W. A. CURRY. Pp. 1,084; illus. London: Chapman & Hall, Ltd. Price: 46s. 6d.

This is the third edition of a work which is recognised as a standard textbook in this country as well as in America. Technical progress in radio communication has been very rapid since the last edition was published in 1927; for instance, the whole technique of long-range communication, by high-power valve transmission on the one hand and by short-wave beam systems on the other, was only in its infancy six years ago. Broadcasting technique has also made considerable progress, as has directional signalling for navigational purposes, especially in connection with aircraft, and there is much new knowledge concerning frequency control, the propagation of waves, and the attenuation of radiated energy.

All these developments are now included by the addition of some eighty pages, and the omission of a good deal of matter concerning spark telegraphy. Television is not included, and the latest developments in very short-wave working are only touched upon; but these have hardly yet advanced beyond the experimental stage, and the matter in the book sticks closely to the title. This, indeed, is as welcome as it is rare in books on radio communication. The work is excellently produced, and radio engineers will welcome this new edition of an old friend, while new students of the subject would be well advised to make its acquaintance.

Calculus for Engineers and Students of Science. By John Stoney. Pp. 405; illus. London: Sir Isaac Pitman & Sons, Ltd. Price 8s. 6d.

This would have been better entitled "Examples in Calculus . . . . " for after two short chapters on differentiation and integration the author plunges headlong into a sea of examples, and a very troublous sea it proves. Several of these later chapters have no titles and no very obvious solution of subject matter: this, combined with the absence of an index, makes it very difficult to find one's way back to any particular example or section. The introductory chapters are superficial and desultory, and omit the foundation work of first principles and method. The student is advised to memorise a list of six functions, whereas one would suffice, the others all following from it. Then a rule is given for integrating x^n but no exception is noted, and even when this exception occurs (in an example half-way through the book) the point is not brought home. On three consecutive pages in the first chapter the symbol d is used instead of δ. The latter is then reverted to, and later still the symbol d is formally introduced and explained. It is unfortunate that an error so confusing to a student at this stage should have been allowed to pass into a second edition. Again, no attempt is made to explain the idea of *function*, and the distinction between constants and variable is never brought out.

However, once the attempt to *teach* the calculus has been abandoned, the book settles down to a very useful collection of technical examples. It would make a good second string for an engineering student studying from a book of pure mathematics. The examples are thoroughly practical in character and in many cases are illustrated by a graph or diagram.

Modern Physics, by G. E. M. JAUNCEY. Pp. 568. London: Chapman & Hall, Ltd. Price: 22s.

This is described as a second course in modern physics. Its purpose is to act as a kind of "refresher" course for those who have passed their student days. The world of physics has become so large and so complicated that few other than those constantly teaching physics in a university or technical college can hope to remember everything.

The historical introduction makes delightful reading. Then follows a chapter on some useful mathematics. This, one wishes, might have been a little more comprehensive, but there is so much to come. Among "modern" subjects treated are the electron, the photo-electric effect, applications of X-rays, radio and television, geophysics and relativity, while a final chapter covers the quantum theory and the uncertain state of affairs which still exists as to the nature of matter and of light. Heisenberg's uncertainty principle and its possible effect on the freedom of the human will brings an interesting chapter to an end.

The author takes the view that a theory is to be judged only by its usefulness. In this book he has managed to explain most of the theories of modern physical workers, and to give the benefit of established relationships to his readers in the shape of a commendable reference work. Ten minutes a day with a book like this would do much to keep the working physicist or engineer up to concert pitch.

Fondamenti de Fisica Technica (Fundamentals of Technical Physics), by UGO BORDINI. Pp. 702. Bologna: Nicola Zanichelli. Price: Lire 90.

This is an exhaustive book on the fundamentals of technical physics by the Professor of Technical Physics at the Italian Royal School of Engineering in Rome. Apparently the first of two or more volumes, it extends to over 700 pages and is divided into three main sections with a total of fifteen chapters. The first of the latter is devoted to radiant energy, the subject being exhaustively dealt with under five main headings, the principles laid down by Kirchhoff and the laws established by Stefan, Wien, and Planck being all outlined. Next, the subjects of optics and photometry are similarly treated at length. The third chapter, dealing with the fundamentals of illumination technics, is one that will appeal to electrical engineers, particularly the section in which the author speculates on the possibility of future developments in the production of artificial light. The second section of the work is entirely devoted to the transmission of heat, while in the third part thermodynamics form the subject of discussion in no fewer than five chapters, these being followed by others on gases and the technics of and apparatus for the generation of heat and power.

Being printed in Italian, the work will, we fear, have a somewhat restricted appeal in relation to its important character, but if it meets with the success that it merits in Italy doubtless the publication of an English edition may be considered.

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Shorter Notices

"The South African Municipal Year Book," 1932-33. Edited by W. P. M. Henderson and F. G. Pay. Pp. 542. London: E. G. Allen & Son. Price 25s.—This year's edition incorporates several changes. With the growth of engineering and electrical enterprise in South Africa, the particulars in this section are very much more comprehensive than those published previously. Data relative to municipalities and local bodies have been revised and the comparative statistics relating to finance, populations, tramway undertakings, water supply and electricity are dealt with in such a manner as to form a comprehensive reference to the whole of South Africa.

The Diamond Jubilee (1933) issue of Willing's Press Guide (2s. 6d.) has just reached us. Its contents are laid out in the same form as last year but have been revised again. The amalgamations which have taken place during the past twelve months are included in the introduction, as are also the publications which have ceased to be, and those which have only just started to be.

"Handbook for Electric Welders." Pp. 134; figs. 68. London: Murex Welding Processes.—The third edition of this work contains an extra chapter on the theoretical aspect of welding design, and more detailed information regarding arc-welding. A short bibliography has been provided at the end of some chapters and abstracts from the regulations of the ship classification societies and of the Home Office have been added.

"Commission Internationale de l'Elairage." Eighth session September, 1931. Cambridge: The University Press. Price: 20s.

"Photo-electric Cell Applications," by R. C. Walker and T. M. C. Lance. London: Sir Isaac Pitman & Sons. Price: 8s. 6d.

"The Working Principles of Motor Vehicle Lighting and Starting," by W. C. Stoddart. London: "Automobile Electricity." Price 15s.

"Wireless Over Thirty Years," by R. N. Vyvyan. London: George Routledge & Sons. Price 8s. 6d.

In the Courts

THE hearing of the action brought by Marconi's Wireless Telegraph Co., Ltd., against Philips Lamps, Ltd., claiming damages for the infringement of patent No. 13,636 of 1913, relating to improvements in receivers for use in wireless telegraphy, was continued last week.

Presenting the defendants' case, Mr. Moritz, K.C., said that he intended to call very little evidence. The defendants' position was that so much was common knowledge and so much was admitted by the plaintiffs' witnesses which the defendants had desired to prove that it would probably be necessary to call only one witness to deal with certain specific points raised in the course of the proceedings.

Mr. Leslie W. Meyer, patent agent and electrical engineer, said that he was partly responsible for the designing and carrying out of the defendants' Lindredge experiment to which reference had been made, and in his opinion they had faithfully followed out Lindredge's directions. He was also present at the Marconi experiments and his criticism was that their "A. & B." transformers did not correctly reproduce the resistances Lindredge employed and that this had a very important effect with respect to reaction and the shunting of the lines. He had very carefully considered the plaintiffs' specification and in his opinion it had not been infringed by the defendants' three-valve all-electric set.

On Monday last, at the conclusion of the evidence for the defence, Mr. Whitehead, K.C., in replying for the plaintiffs, said that where there was no attack on novelty and there was proved commercial utility of the magnitude enjoyed by the Franklin invention it required very remarkable circumstances to secure that a patent should be held to be invalid on the ground of lack of subject matter. On the question of construction, Counsel said it was true that the anode circuit was stated by Franklin to be a tuned circuit, but he submitted that it did not affect the specification. Taking the broad idea of the Franklin invention he contended that it was incontestible that it had been used in the defendants' alleged infringing set.

His Lordship reserved judgment.

A Neon Sign Dispute

In the King's Bench Division on June 29th Mr. Justice Swift heard an action by Dr. Albert B. Miller, an electrical engineer, against Mr. Frank H. Wingrave. Owing to the technical nature of the case Mr. C. P. Sparks, M.I.E.E., sat with the judge as assessor. The plaintiff claimed damages for breach of a contract by which the defendant undertook to pay him £100 a month to supervise the completion of a model of a neon sign which the defendant had invented. The plaintiff was later to be appointed managing director of a company to manufacture the sign at a salary of £1,000 per annum and commission. Dr. Miller said that contrary to the agreement the defendant had terminated his engagement and had failed to carry out the contract.

The defendant pleaded that he engaged Dr. Miller on his representation that he was an expert in electrical and engineering matters, but he had failed to render any service to the defendant and was in fact incompetent. Up to the present the manufacturing company had not been formed and no cash consideration had been paid.

At the conclusion of the evidence his Lordship, in giving judgment for the plaintiff, said the defendant had not sufficient electrical knowledge to enable him to get his model working for exhibition purposes. The arrangement he made for the services of the plaintiff was a definite contract. In accordance with the arrangement the plaintiff started and took charge, more or less, of the work on the model. He (the judge) having heard the evidence was not quite sure that the plaintiff had been allowed an unfettered hand to do what he liked or to order what he liked. The plaintiff might have made some errors of judgment but he found that the defendant had not proved that the plaintiff had not done his duty to him under the contract. The ground on which the defendant claimed to be entitled to terminate the contract was that the plaintiff was incompetent to do the work he was engaged to do. To his mind that had not been proved. He awarded the plaintiff £500 damages with costs, and judgment was entered accordingly.

A Cancelled Clock Agreement

At the Sheffield County Court last week the New System Private Telephones (Notts and Yorks), Ltd., claimed from J. Stead & Co., Ltd., Sheffield, £5 7s., being one quarter's rent in advance for an installation of electric clocks. The defence was that the clocks had proved unsatisfactory. Counsel for the plaintiffs said that although the claim was for only £5 7s., roundly about £150 depended upon it, as the hiring agreement relating to the installation had still several years to run. The installation had been working some four years. During that time, of course, a certain number of faults and inaccuracies occurred, but they were corrected by the plaintiffs, as provided in the agreement. At the end of that time, defendants discovered another system of clocks which they could install more cheaply, and was, perhaps, slightly more accurate, and they came to the conclusion that they would not pay any more rent but would cancel the contract. That contract, however, was for a term of ten years, and he contended that nothing had happened which justified defendants in cancelling it.

Counsel for the defendants said that a thing which was hired must be reasonably fit for its purpose, and his contention was that the installation in question had not been so fit. He agreed that there must be some latitude in such a case, but in this instance the deficiencies had gone beyond what was reasonable. They had now installed clocks which were never a minute wrong.

Evidence was given on both sides with regard to the number of complaints made about the clocks, and the general behaviour of the installation. Judge McCarthy said that the question was one of fact as to whether the installation had proved so faulty that there was no basis for the contract at all. In his opinion defendants had made out their case amply, and he gave judgment in their favour.

Parliamentary News (BY OUR SPECIAL REPORTER)

ON June 29th, Mr. G. Hall, the Labour member for Aberdare, introduced an Electricity (Supply) Bill, which seeks to amend Section 16 of the Electricity (Supply) Act, 1919, and Section 21 of the Electricity (Supply) Act, 1922 (relating to compensation for deprivation of employment). It is supported by members of all parties—Mr. T. J. O'Connor, Sir Henry Jackson and Capt. Cunningham-Reid (Conservatives), by Mr. Isaac Foot (Liberal), and by Mr. Hicks (Labour).

Mr. W. Thorne asked the Parliamentary Secretary to the Treasury if he was aware that the Bill was an agreed measure as regarded both employers and workmen, that there was no opposition from the Ministry of Transport, and whether, in these circumstances, the Government would give facilities for its passage.

Capt. Margesson, in reply, said that he was not in possession of that information, but if no objection was raised to the Bill at the time allotted to private members after eleven the Bill would receive a second reading by assent. The Government would not object to it.

Middlesbrough Relay Scheme Banned

On July 3rd the Middlesbrough Corporation Bill was read a second time.

Mr. Lyons moved that it be an instruction to the Committee which was to consider the Bill to leave out Part VII by which the Corporation sought to establish and maintain a wireless exchange, and to broadcast programmes by re-diffusion. This would mean a real inroad on the deliberately balanced programme of the B.B.C., and would undermine the principles laid down when the B.B.C. was first established. His objection to the re-diffusion, for which power was sought, was that it was an example of municipal trading carried to its furthest point. Mr. Levy supported the motion.

Mr. Griffith, a local member, said that no power was sought in the Bill to originate any matter; they could only "turn the tap on and off." He supported the Bill. Mr. Hicks said that if the Middlesbrough Corporation were able to provide a cheaper broadcast relay it ought to be given credit for its initiative.

Sir K. Wood, the Postmaster-General, said there were already about 100,000 subscribers through these wireless exchanges. This was only about 2 per cent. of the total number of licence holders of the country, but the number was growing and it was certainly a matter of importance for the House of Commons to watch the progress and the tendencies of a great public force of this character. The question for the House to decide was whether in the circumstances the Corporation for the first time be afforded a licence by the Postmaster-General. He had recently revised the conditions under which these relay stations worked. In the first place, nobody was allowed to originate any broadcast whatever; they might only pass on what was received from other stations. So far as broadcasts generally were concerned, he had the power to prohibit any particular relay. It had never been used and so far as the present relay stations were concerned, he had had no complaint from any subscriber. If municipal corporations or any other body were granted a licence they would in no circumstances be permitted to receive any payment or consideration for relaying any programme. Therefore, there could be no suggestion that any of these relay stations could receive any money for relaying a Continental programme which included advertisements. There was a further condition that no wireless exchange might relay to its subscribers any programme or message containing political propaganda received in English from a foreign station. All these licences were subject to termination at six months' notice expiring in December, 1936, at which time the B.B.C. licence fell due for consideration. The House had empowered municipal corporations to give entertainments; these relays were entertainments. It was not for him to pick and choose between the people to whom he issued licences provided they were responsible people who would carry out the conditions imposed.

The instruction to the Committee to delete Part VII was carried by 144 votes to 48.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Heavy Bookings for the B.I.F.

Within twelve days of the issue of application forms for the 1934 British Industries Fair the Department of Overseas Trade announces that more than 100,000 sq. ft. of exhibition space has been booked by exhibitors in the various sections, excluding textiles, at Olympia and the White City. Bookings for the Birmingham Section are 25 per cent. in excess of those recorded up to this time last year, the greatest demands for space being in the engineering, electrical, heating, cooking and hardware sections.

Russian Trade Embargo Removed

After protracted negotiations, Messrs. Thornton & Macdonald, the Metropolitan-Vickers employés who were imprisoned by the Soviet authorities, were released last week-end and simultaneously the ban on Russian imports imposed by the British Government was removed. Later it was announced that the Russian counter embargo on British goods had also been withdrawn.

Delegates and guests at the Exide Convention banquet at the Town Hall, Torquay

Electrical Engineering Activity

The B.E.A.M.A. Index of Activity for May shows a figure of 63.1 (based on 1924=100), as compared with 68.3 in April, and 65.2 in May, 1932.

The Marking of Electrical Accessories

A draft Order-in-Council was laid before Parliament on June 27th, requiring the following imported electrical accessories to bear an indication of origin on sale or exposure for sale in the United Kingdom: Lampholders, ceiling roses, adaptors for lampholders, switch plates, and the following articles up to and including 30 A: Switches, cut-outs, fuses, wall sockets, plugs and plug adaptors for wall sockets, and plugs and sockets for use as connectors to portable or mobile appliances. Copies of the Draft Order are now obtainable from H.M. Stationery Office (price 1½d. post free).

New Zealand Imports

Preliminary figures have been issued of the electrical trade of New Zealand during 1932. The following table shows the value of imports, with participating countries, of the two main groups as compared with 1931:—

	1932. Thous. £.	Inc. or dec. as compared with 1931. Thous. £.
Electrical apparatus—		
Total	675	−630
From United Kingdom	497	−251
Canada	31	− 33
Australia	55	− 3
Germany	15	− 6
Holland	5	− 17
Sweden	8	− 58
United States	51	−248
Telephone and radio apparatus—		
Total	261	− 68
From United Kingdom	41	− 21
Canada	12	+ 2
Australia	49	+ 49
Belgium	2	− 6
Holland	5	− 6
United States	151	− 46

Electricity in Canadian Industry

The electrification of industries as well as the use of electricity for domestic purposes is steadily increasing in Canada, states *Reuter's Trade Service* (Ottawa). According to an estimate by the Government Bureau of Statistics, over three-quarters of the Canadian manufacturing industries were electrified in 1931 compared with 61 per cent. in 1923. The amount of electricity used in Canada for all purposes in 1932 amounted to 15,347,218,000 kWh as against 15,103,831,000 kWh in 1931, an increase of 243,387,000 kWh. Of thirty-five manufacturing industries, over a third were more than 90 per cent. electrified in 1931 and twenty-seven more than eighty per cent. Two of the most highly electrified industries are the motor-car and casting and forging industries.

The Exide Service Convention

Over six hundred delegates and guests attended the banquet of the thirteenth Exide Service Convention at the Town Hall, Torquay, on June 28th. Among those present were the Mayor of Torquay, Councillor W. Denis Thomas, J.P., the Deputy-Mayor, Councillor A. J. d'Espiney, and other members of the Torquay Corporation as well as Mr. W. Y. Smith-Saville, manager of the Exeter Corporation Tramdays. Mr. D. P. Dunne, managing director of the Chloride Co. and chairman of the Convention, proposing the toast of "The Mayor and Corporation of Torquay," thanked the Mayor for the warm welcome extended to the delegates. The Mayor in reply expressed the hope that the delegates had enjoyed Torquay's many pleasures and amenities. The toast of "The Visitors and the Press" was proposed by Mr. H. V. Schofield, sales manager of the company. A cabaret entertainment, followed by dancing in the Town Hall Ballroom, rounded off an enjoyable evening.

Australian Duties on Dry Batteries

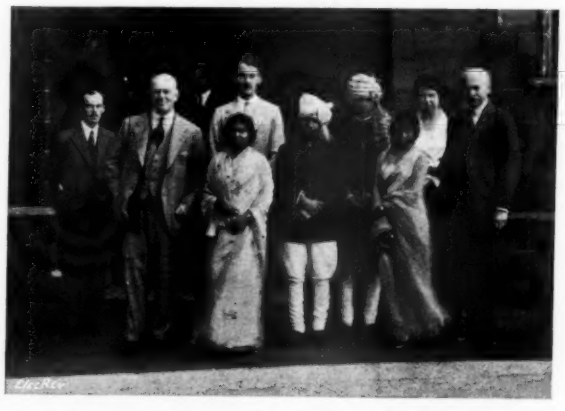
A reduction in the duties on dry batteries and dry cells is recommended by the Australian Tariff Board. In its report the Board states that during 1931-32, despite the existence of five manufacturers, the reduction of prices, and slackening of demand, the principal manufacturers made excessive profits. Further, excessive profits were made during the period when importation was prohibited. The present high prices of original and replacement batteries interfered to some extent with the use of wireless equipment. The *ad valorem* equivalents of the existing fixed-rate duties ranged as high as 300 per cent. Ample protection for efficient local manufacturers, the Board considers, would be provided by reducing the duties to 35 per cent. British preferential tariff, and to 55 per cent. general tariff.

The Japanese Electrical Industry

A copy of "A Summary of Progress in the Electrical Industry of Japan at the End of 1931" has been received from Denki Kyokai (Electrical Association of Japan). A review of the industry in 1931 appeared in our issue of April 28th (page 592).

Works Visit

The Maharajah of Travancore visited the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd., on June 27th. He was accompanied by his mother and sister, and members of his suite. The visitors passed through several



The Maharajah of Travancore with his suite at Trafford Park. Messrs. G. E. Bailey and J. S. Peck, directors, are to be seen in the group

of the manufacturing departments and were shown a million-volt power discharge in the high voltage laboratory. They took tea in the Research Department before leaving.

Trade Announcements

Aurora Lamps, Ltd., have appointed Messrs. Barnard Windle, Ltd., 41, Chapel Street, Salford, Manchester, and also of Nelson, Lancs, as sole selling agents in Lancashire, Cheshire, Westmorland and Cumberland.

The Dubilier Condenser Co. (1925), Ltd., has appointed Mr. S. B. Haslam, Cardiff Road, Taffs Well, Glam., as its representative engineer in South Wales in connection with the sale of static condensers for power factor correction purposes.

Owing to increased business the T.B.T. Electric Co., Ltd., has removed its stores department to 89, Upper Thames Street, London, E.C.4.

Mr. T. D. Liddell, electrical contractor, has removed his business to 3, Whitehall, Maybole, Ayr.

The General Accessories Co., Ltd., states that Mr. George Marr is no longer connected with the company. Mr. G. L. Grindley has been appointed to call upon customers until recently visited by Mr. Marr.

Edinburgh Trades Holiday

The works of Messrs. Bruce Peebles & Co., Ltd., will close on July 21st and reopen on July 31st, and no goods will be received or despatched during that period.

An E.D.A. Processional Car

The Publicity and Campaign Committee of the British Electrical Development Association has prepared a processional car for the use of its members in summer carnivals. The ensemble includes three girls to represent Light, Heat and Power. The central feature is draped in gold consistent with the message "The Golden Age of Electricity" on a streamer across the top of the van, the secondary colours being yellow and orange. The display will include draperies for the three girls and a uniform for the driver. Accommodation is provided on the two sides of the car and on the steps at the tail end for appliances. The display has been available since July

The E.D.A. processional car

1st and has already been booked for carnivals at the following places:—Wembley, July 1st; Tamworth, July 15th; St. Albans, July 29th; Wood Green, September 20th; and Southgate, September 30th. Members are advised to notify the Association immediately of the dates on which they require the car as bookings will be allotted in strict rotation. The display is shown in the accompanying illustration.

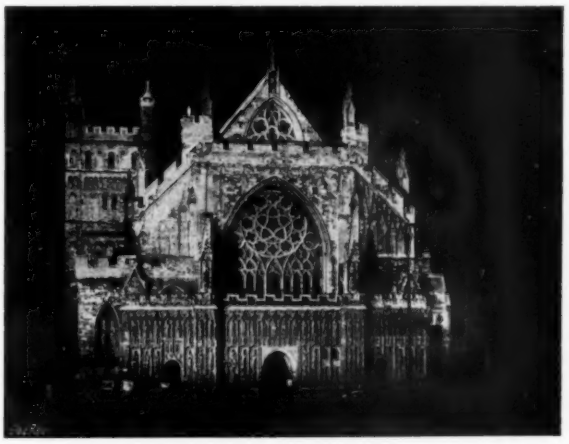
That the processional car is going to prove a success is indicated by the fact that it secured the second prize at the Harrow and Wembley Hospital Carnival which was held on Saturday last.

A Latvian Power Station Contract

British, Dutch, French and Swedish firms have already begun negotiating with the Latvian Government for the contract for the erection of the Dwina hydro-electric power station. The original contract lapsed last week owing to the failure of the American Foundation Company to arrange a loan of $6,000,000 (£1,200,000 at par) to carry out the work. The Latvian Government refused to accept the company's proposal to prolong the contract as it has prospects of arranging better conditions with the other firms who have opened negotiations.—*Reuter* (Riga).

Exeter Cathedral Celebrations

In connection with the Festival Week held at Exeter to celebrate the eight hundredth anniversary of the Cathedral a special floodlighting installation was carried out. Holophane "No. F.L.1000" units were used for the lighting of the Cathedral, these being of similar type to those employed for Westminster Abbey and Big Ben on the occasion of the International Illumination Congress some eighteen months ago. Ten units mounted on trees on the Cathedral green illuminated the west front, while long-range units for the west face of the



Exeter Cathedral floodlighted in celebration of its eight hundredth anniversary

North Tower were supplemented by a wide-angle type projector mounted on the roof. Three rectangular beam type units were employed for the north face of this tower. The South Tower was lighted on the south side by two rectangular beam type units and on the west side by two rectangular type and one concentrating type projector, the whole installation being composed of twenty-three Holophane 1,000-W projectors.

A Swiss Neon Tube Association

An association of neon tube manufacturers in Switzerland has lately been organised at Zurich, the object being to protect their interests against cheap foreign competition, to improve Swiss productions, and to encourage their use in the country.

Dublin Wireless Exhibition

A wireless trade exhibition will be held in Dublin next September.

"Aeroto" Fans

In our last issue (p. 946) in referring to Messrs. Davidson & Co.'s fan developments, we stated that "work is about to commence on the manufacture of the first 'Aeroto' mine ventilating installation." We should have added the words "in a British colliery." Messrs. Davidson have supplied "Sirocco" fans for use in mines for over thirty years. The reference was solely to "Aeroto" axial-flow mine fans, several of which are now being manufactured for British collieries.

New Chinese Customs Tariff

The *Board of Trade Journal* publishes a list of goods affected by the new Chinese Customs tariff which came into force on May 22nd. Specific duties are expressed in gold units of a fixed value of 19.7265d. (gold currency), and include the following:—

	Rate of Duty (Gold units).
Electrical machinery for power generating and transmission, such as dynamos, motors, transformers, convertors and parts thereof	7½%
Prime movers, *i.e.*, gas engines, oil engines, steam engines, hydraulic tubines, steam turbines, turbo-generator sets, and other prime movers, combined with generators or not, and parts thereof	7½%
Steam boilers, economisers, superheaters, mechanical stokers, and other boiler-room accessories, and parts thereof	7½%
Electrical materials, fixtures, and fittings for wiring, transmission, and distribution:—	
(*a*) Bulbs ... ... (per 100)	4.00
(*b*) Cleats, insulators, or knobs, ceiling rosettes, fuse-boxes, plugs, receptacles, sockets, switches, and switchboards	20%
(*c*) Cords or wires, cables, and all other electrical materials, n.o.p.f. ...	15%
Electric cookers, fans, flash-lights, irons, lampware, radiators, toasters, and other similar appliances, and parts thereof	20%
Electrical accumulators, batteries, condensers, and parts thereof	20%
Telephonic and telegraphic instruments, and parts thereof:—	
(*a*) Radio sets and parts:— From 12½% to	20%
(*b*) Others	12½%

Import of Turbo-generator Parts into Australia

A report of the Australian Tariff Board recommends that all turbo-generator parts which cannot be manufactured in Australia shall be admitted free of duty, irrespective of whether they are imported singly or as portions of a completed turbine. This means that the duty of 45 per cent. will be charged only on those portions of an imported turbo-alternator which can be made in Australia.

Victorian Electricity Commission

Praise for the work of the Victorian Electricity Commission and criticism of its retail trading operations were expressed by Mr. Macfarlan, Minister in Charge of Electrical Undertakings, after a tour of inspection of the Commission's hydro-electric works at the Rubicon and Sugarloaf. He said that when the magnitude and importance of the Commission's operations were

appreciated, and the great success in developing them was understood, it was not a matter for wonder that the Commission had thought it worth while to adopt the rôle of a State merchant, competing with private enterprise in the sale of electrical appliances. These retail activities, however, could readily be left to private dealers. It could not be too strongly emphasised that the real and legitimate functions of the Commission were the generation and supply of electrical energy. The claim of the Commission that by the sale of appliances it increased its domestic demand for energy was discounted by the fact that the same purpose could be served by leaving that field to private enterprise, especially if the Commission would assist private traders. Its present methods, so far from assisting private traders, threatened them with extinction. The freedom of the Commission from rates, rents, and taxes, and its vast financial resources, all rendered competition on anything like equal terms impossible.

Wakefield Grammar School floodlighted during the recent pageant

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price, July 5th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll... ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3⅝d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£201	£2 dec.
Grade II ... ... ,,	£138	£1 dec.
Grade III ... ... ,,	£68	—
c Brass (rolled metal 2" to 12" basis)... per lb.	7⅜d.	—
c ,, Tubes (solid drawn) ... ... ,,	9¼d. to 9½d.	—
c ,, Wire, basis ... ... ,,	7¼d.	¼d. inc.
c Copper Tubes (solid drawn)... ... ,,	10¼d.	—
g ,, Bars (best selected) ... ... per ton		
g ,, Sheet ... ... ,,	£68	—
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£41 10s.	£7 5s. inc.
d ,, ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£48	—
d ,, ,, H.C. Wire ... per lb.	7¾d.	⅛d. inc.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	5½d.	¼d. dec.
i Iron, Pig. (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English Pig ... ... ,,	£15	5s. inc.
g Mercury ... ... per bot.	£8 15s. to £9 10s.	—
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	—
p ,, ,, rolled strip & sheet ,,	11d.	—
p ,, ,, wire ... ... ,,	1/0½d.	¼d. dec.
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	9d.	—
r Steel, magnet, in bars ... ... ,,	7½d.	—
n Tin, Block (English) ... ... per ton	£224 15s. to £226 15s.	£1 dec.
g ,, Wire, Nos. 1 to 16 ... ... per lb.	3/5	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

Metrovick at Manchester Coal Exhibition

A wide range of products for mining service to be shown by the Metropolitan-Vickers Electrical Co., Ltd., at the Coal Exhibition which commences to-day at Belle Vue, Manchester, will include motors, controllers, transformers and switchgear for use in fiery mines; industrial type motors and control gear for surface electrification; and a Lilly overwinder for the protection of steam or electric winders.

Floodlighting at Wakefield Pageant

Three successful floodlighting installations have been carried out at Wakefield in connection with the recent Pageant in that city, two of which, the Cathedral and the Grammar School, were of a temporary character, whilst the third, the war memorial, is a permanent feature. At the invitation of Mr. R. O. Seville, city electrical engineer, the lay-out in each case was designed and prepared by the Illuminating Engineering Department of Siemens Electric Lamps and Supplies, Ltd., with the assistance of the deputy electrical engineer, Mr. H. White. The whole of the necessary floodlights, projectors, lamps, cable and general supplies were supplied by Siemens's, the installations being carried out by electrical contracting firms (E.D.A. Circle) of Wakefield. In all seventy-four floodlights and projectors were used, ranging from 200 to 1,000 W. The war memorial has been permanently floodlighted by means of two specially constructed asymmetric floodlights equipped with adjustable side shields.

Recent Contracts

The English Electric Co., Ltd., has received an order from the Huddersfield Corporation for a complete trolley-bus. The chassis will be of the six-wheel type manufactured by the Associated Equipment Co., with a double-deck body seating sixty passengers. The electrical equipment includes an 80-h.p. motor with regenerative control.

The Sunbeam Motor Car Co., Ltd., has received a further order from the Wolverhampton Corporation for six-wheel trolley-bus chassis. The vehicles will have 58-seater metal bodies by the Metropolitan-Cammell-Weymann Co.

Extension of Ilford Showrooms

The Ilford Town Council is considering a scheme for the reorganisation of the installation department involving the extension of the central showrooms, &c., at an estimated cost of £6,000.

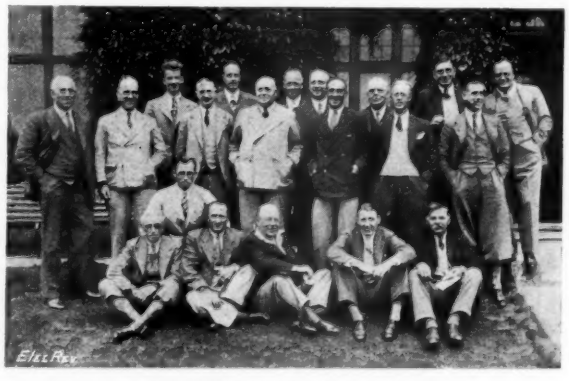
For Sale

The engineering works of Messrs. North & Sons, Ltd., Watford, are to be sold.

(See our classified advertisements.)

Social Events

The Brighton and District Electrical Trades Golfing Society held an all-day meeting at West Hove golf course on June 28th, the winners being as follows :—Morning round : First, Mr. Holford; second, Mr. A. E. Hewett. Afternoon round : First, Mr. E. Colvill; second, Mr. R. N. Torpy. Novice's cup : First, Mr. P. Ash; second, Mr. B. S. H. Warde. Among those who took part were Messrs. W. F. Moir, S. H. Callow and C. H. Cox (E.L.M.A.), Mr. W. N. C. Clinch, borough electrical engineer of Brighton, and Mr. R. N. Torpy, borough electrical engineer of Tunbridge Wells, who are seen in the group photograph reproduced herewith by courtesy of the *Sussex Daily News*.



Electrical golfers at Brighton

The G.E.C. Amateur Athletic Association team achieved an outstanding performance recently at the Witton Works annual sports, when it won all four of the championship trophy events, open to all branches of the G.E.C. in Great Britain.

The staff and employés of the Merthyr Electric Traction & Light Co., Ltd., held their annual outing recently when they visited Weston, Cheddar Wells and Glastonbury. Mr. L. W. Dixon, the managing engineer, presided at the luncheon,

others present including Mr. F. J. Cursons, the secretary, and Mr. C. T. Allan, of the South Wales Electrical Power Distribution Co. After lunch the party visited Cheddar Caves, Wells Cathedral, and other places of interest.

E.D.A. At the Highland Show

The accompanying photograph shows the British Electrical Development Association's stand at the recent Highland Show, Dundee. The Scottish Area Committee, assisted by the Grampian Electricity Supply Co., Ltd., the Dundee Electricity Department, and the Dundee E.D.A. Circle, organised a very successful display which included dairy, poultry and general farming equipment. A new feature which attracted a good deal of interest was an example of electrical soil heating shown in section on a large-sized frame. The extensions of the grid in Scotland have led the farmers to study the possibilities of electricity, and there were many inquiries from outlying districts for terms and conditions of supply.

The comprehensive electro-farming exhibit of the E.D.A. at the Highland Show, Dundee

New Catalogues and Lists

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—Leaflet No. R 61/1 illustrating and describing a push button starter.

Edwardes Bros., 20, Blackfriars Road, S.E.1.—A wholesale price list (No. 79) of electrical fittings.

W. Canning & Co., Ltd., 133-137, Great Hampton Street, Birmingham.—Leaflets dealing with two new plating barrels for small articles.

Grosvenor Electric Batteries, Ltd., 2/3, White Street, Moorgate, E.C.2.—A price list of "Miscanlite" torches and a folder describing the new "Turnlight" hand lamp.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.—Publication No. 1820 dealing with rotary dryers.

National Gas & Oil Engine Co., Ltd., Ashton-under-Lyne.—The June "National Bulletin," describing further developments in sewage gas engine installations.

Phœnix Telephone & Electric Works, Ltd., 38, Newman Street, W.1.—The second edition of the company's catalogue (ninety-six pages) of telephones, electric bells and accessories.

J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham. Leaflets illustrating and describing the new "Stelac" 5-A pressed steel fuseboards and the "Telac" indicating control units for enclosed element appliances.

W. Sisson & Co., Ltd., Elmbridge Road, Gloucester.—An illustrated catalogue giving particulars of the design and manufacture of Sisson steam engines.

Maxim Lamps, Ltd., Canonbury Road, N.1.—A folder giving prices and details of "Maxim" lamps.

Hopkinsons, Ltd., Huddersfield.—A 534-page catalogue, profusely illustrated, of boiler mountings, valves and miscellaneous fittings. Also list No. 3201, relating to Hopkinsons' patent steam traps.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—The company's June "Progress Sheet" and the "Osram G.E.C. Bulletin."

Babcock & Wilcox, Ltd., Babcock House, Farringdon Street, E.C.4.—Catalogue No. 1095A dealing with the company's fusion welding process.

Arora Co., Loughborough.—A leaflet describing recent Arora products, including a 4-pt. kettle and a towel rail.

Private Arrangement

Wates Radio, Ltd., wireless apparatus manufacturers, 184-8, Shaftesbury Avenue, W.C.2.—A meeting of creditors was held on June 26th at Anderton's Hotel, Fleet Street, E.C. The statement of affairs showed liabilities of £5,564 and assets of £4,988, leaving a deficiency so far as the creditors were concerned of £576. It was stated that the directors intended to suggest a moratorium whereby the creditors would eventually receive 20s. in the £, and it was intended that 20 per cent. of the debts should be paid in five months, 20 per cent. in nine months, and 10 per cent. in twelve months; further payments to be decided at the end of a period of twelve months. A resolution was passed requesting the directors to take steps to put the company into voluntary liquidation.

Bankruptcy Proceedings

J. Stewart, radio dealer, 10, Murton Street, Murton Colliery, Durham, late Seaside Lane, Easington Colliery, Durham.—The adjourned examination was held recently at the County Court, Sunderland. The statement of affairs lodged showed a deficiency of £1,061. Debtor attributed his failure to ill-health, hire-purchase agreements being cancelled by customers, and rapid depreciation of stock. At the previous hearing the representative of a firm of radio wholesalers said that debtor had not handed over to his firm a sum of between £50 and £60 collected from customers, and the examination was again adjourned to allow debtor to check a list of amounts alleged to have been omitted.

E. Cohen (trading as the Manor Wireless Supply Stores), wireless dealer, 746b, Romford Road, Manor Park.—The adjourned first meeting of creditors was held on June 29th at London Bankruptcy Buildings when a statement of affairs was presented showing liabilities of £981 and assets of £93. A resolution was passed for Mr. A. S. Darr to act as trustee and administer the estate with a commitee of inspection. The following are the principal creditors:—British Battery Co., Ltd., £52; J. J. Eastick & Sons, Ltd., £192; Electric Lamp Services, Ltd., £128; Warner & Sons, Ltd., £98; Zakon, £100; Zeitlin & Sons, Ltd., £59.

F. M. Clarke, electrical engineer, 3, Joyce Avenue, Sherwood, Nottingham.—The first meeting of creditors was held at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham, on June 29th. Debtor attributed his failure to the effects of an accident and lack of capital. His statement of affairs showed gross liabilities of £292, and a deficiency of £149. The matter was left in the hands of the Official Receiver, as trustee.

J. O. Storey (trading as J. Storey & Son), electrical engineer and wireless dealer, 227, Stockport Road, Ashton-under-Lyne, Lancs.—The public examination took place recently at the Town Hall, Ashton-under-Lyne. According to the statement of affairs returned the assets were estimated to produce £70, and there was a deficiency of £506. Debtor attributed his failure to depression in trade, bad debts and inexperience. The examination was adjourned.

F. J. King, radio dealer, 51, Regent Street, Sheffield, Yorkshire.—This debtor's public examination was held at the County Court Hall, Sheffield, on June 29th. A statement of affairs had been filed which showed liabilities of £337, with assets of £72. The examination was closed.

W. R. Blakeway (Pearson & Co.), electrical contractor, 31, High Street, Southampton.—Last day for receiving proofs for dividend July 11th. Trustee, Mr. H. W. Miles, 44, Above Bar Street, Southampton.

C. E. Pitman, electrical contractor and wireless dealer, 12, Station Road, West Croydon.—First and final dividend of 2d. in the £, payable June 30th at the Official Receiver's offices, 29, Russell Square, W.C.

A. E. Tucker, electrical contractor, 9, Courtney Road, Waddon, Surrey.—Receiving order made June 27th on debtor's own petition.

L. Wardleworth (L. & V. Wardleworth), radio and electrical engineer and contractor, 335, Bury Old Road, Heaton Park, Manchester.—Receiving order made June 28th, on a creditor's petition.

F. W. T. Layton and **R. E. Mills** (East Anglian Wireless Co.), wireless engineers, Hamilton Road, Felixstowe.—First and final dividend of 1s. 11½d. in the £, payable July 10th at 9, Arcade Street, Ipswich.

J. E. Lander, electrical and radio engineer, 26, Union Street, Newton Abbot.—Receiving order made June 23rd on debtor's own petition.

H. F. Griffiths, electrical engineer, 19, Mount Pleasant, Bilston.—Receiving order made June 22nd on debtor's own petition.

Company Liquidations

London Electric Service, Ltd., 5, Denmark Street, Charing Cross Road, W.C.—The statutory first meetings of creditors and shareholders were held on June 30th at the Board of Trade Offices, Carey Street, W.C. No statement of affairs had been lodged; eighteen proofs of debt aggregating £934 had been received but it was stated that the liabilities, about ninety in number, would considerably exceed that sum. The failure of the company was attributed to its having to sell its goods on the hire-purchase system; to the fact that an invention relating to improvements in mechanism for cinematograph projectors did not at first prove a success; and also to lack of the necessary capital to facilitate the marketing of an improved production. The liquidation was left in the hands of the Official Receiver.

Mur-Ray Signs, Ltd.—Particulars of claims by August 31st either to Mr. P. E. Bower, 37, Brown Street, Manchester, or Mr. P. C. Parker, 64A, Bridge Street, Manchester, joint liquidators.

Horrabridge & District Electric Supply Co., Ltd.—Meeting, August 18th, at "Morwenna," Plymouth Road, Tavistock, to receive an account of the winding-up by the liquidator, Mr. A. A. Gates.

Corlett Electrical Engineering Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. Houghton, 5, King Street West, Wigan.

Wood & Co. (Ipswich), Ltd.—Winding up voluntarily. Liquidator, Mr. J. B. Sanderson, 5, Arcade Street, Ipswich.

Condenser Electric Co., Ltd.—Meetings, July 26th, at 19, Eastcheap, E.C., to receive an account of the winding-up by the liquidator, Mr. W. H. Cork.

Chronoalarm, Ltd.—Meeting, August 11th, at 8, St. Peter's Church Walk, Nottingham, to receive an account of the winding-up by the liquidator, Mr. D. C. N. Duncan.

Premier Electric Welding Co., Ltd.—Meeting, July 31st, at Imperial Chemical House, Millbank, S.W., to receive an account of the winding-up by the liquidator, Mr. R. W. Liddell.

Nordisk Electrical Power Co., Ltd.—Winding up voluntarily. Liquidator, Mr. E. Boothroyd, 79, Mark Lane, E.C.

Weston Electric Lamp Co., Ltd.—Winding up voluntarily. Liquidator, Mr. M. Thompson, 30, Mark Lane, E.C.

Hawkers, Ltd.—Winding up voluntarily. Liquidator, Mr. H. B. T. Wilde, 45, Newhall Street, Birmingham.

Electricity Supply

Lighting, Domestic, Power

Acton.—ELECTRICITY CHARGES.—A meeting of the Acton Chamber of Commerce was held last week to receive and consider the report of Mr. Shipley, of Messrs. Mackness & Shipley, who had been appointed to go into the question of electricity charges in the borough. The report outlined the grievances so far voiced, and analysed their soundness in the light of a questionnaire recently circulated amongst members. Mr. Shipley came to the conclusion that many members were on the incorrect tariff, and that the new restricted hours tariff was entirely impracticable to most members. The present conditions were such that a severe brake had been put on normal development due to excessive electricity charges, and local manufacturers had found it prohibitive to proceed with plant extensions. He recommended that all consumers should at least check their lighting consumption and see that an endeavour was made to control demand, that excessive sized motors were not installed, and that steps were taken to correct power factor. After discussion the Chamber of Commerce decided that the supply company should be approached for a reduction of the "unit" charge from ¾d. to ½d. all the year round. It was also suggested that the demand should be read and charged monthly.

Annan.—STREET LIGHTING SCHEME REJECTED.—The Town Council has rejected a recommendation to light the streets electrically.

Ayrshire.—RURAL EXTENSIONS.—A proposal of the Ayrshire Electricity Board to introduce special higher rates for electricity supplies in certain villages and districts where prospective consumers cannot guarantee the minimum revenue required has been rejected by the County Council, which, however, is willing to consider any other proposal by the Board.

Barking.—FACTORY SUPPLY.—The Electricity Committee is to supply a factory being erected by Block Batteries, Ltd., at Alfred's Way.

CHEAPER ELECTRICITY.—The following reductions in electricity charges are proposed: Power, from 1d. to ¾d. per kWh. after the first 3,000 kWh per quarter; lighting, flat rate from 4d. to 3½d.; domestic rate, from 1d. to ¾d.; and prepayment meter rate, from 5d. to 4½d.

Birmingham.—PROGRESS OF UNDERTAKING.—Last year the Electricity Department sold 434¾ million kWh, an increase of nearly 46 million kWh—the largest annual increase, with one exception, yet recorded. Revenue from sales of electricity rose by £89,904 to £2,055,601, in spite of considerable reductions in power charges. Working expenditure, including £63,569 in connection with the change-over, totalled £1,114,730, leaving a net revenue of £1,004,001. The net surplus was £183,614, as compared with £175,313 in 1931-32. New consumers connected numbered 11,668, making a total of 130,716, and 4,049 small houses were wired under the assisted - wiring scheme.

This huge G.E.C. lighting fitting has been installed in the Jameson Hall of Groot Schuur University, Capetown. It is over 10 ft. in diameter and can handle a load of 20.5 kW

Bognor Regis.—PRICE REDUCTIONS.—The Bognor Gas & Electricity Co. announces the following reductions in electricity charges: Heating and cooking, from 1¼d. to 1d. per kWh; power, from 2d. to 1¾d.; two - part tariff for lighting based on maximum demand, "unit" charge from 1¼d. to 1d.

Brighton.—SCHOOL HEATING.—The Town Council is to have the new school at Whitehawk heated by electricity, which will be supplied at a "unit" charge of 0.22d.

INQUIRY.—Mr. Henry Nimmo, chief engineering inspector to the Electricity Commission, will hold an inquiry at the Town Hall, Brighton, on July 11th, into an application by the Corporation for a Special Order in respect of the acquisition of certain lands for the extension of the Southwick generating station.

Canada.—ONTARIO COMMISSION'S REPORT.—The annual report of the Ontario Hydro-Electric Power Commission shows a total revenue collected by municipal utilities during the year of $31,216,210. Cost of power amounted to $19,109,036; operation, maintenance, and administration to $5,492,591; interest, $2,532,941; and sinking fund and principal payment on debentures $2,244,368, leaving $1,837,274 for depreciation and other reserves. The number of municipalities served by the system at the end of the year ended October 31st last was 747.

Cardiff.—ELECTRICITY FOR CAERAU VILLAGE.—The Electricity Committee is to supply Caerau village (£1,000).

ALTERATIONS TO BOILER FURNACES.—The boiler furnaces at the power station are to be converted to allow the use of a lower volatile grade of coal or pulverised coal.

NEW SUB-STATION.—A sub-station is to be erected in the vicinity of Caerphilly Road.

Cheadle and Gatley.—TARIFF ALTERATIONS.—The success of the electricity undertaking in achieving a net profit of £3,338 last year has led the Council to reduce its lighting flat rate from 5d. to 4¾d. per kWh. Also, to popularise the all-in tariff, the heating flat rate has been increased from 1d. to 1¼d. per kWh in the winter quarters (instead of 1d. all the year round), and the fixed charge of the all-in tariff has been reduced from 17½ per cent. to 15 per cent. of the rateable value with a "unit" charge of ¾d. all the year round (instead of ¾d. in the summer and 1d. in the winter), the minimum fixed charge being lowered also from £3 10s. to £3 per annum for all houses up to and including £20 rateable value.

Cheltenham.—EXTENSION.—The Electricity Committee has received sanction to loans of £6,500 for mains and £1,493 for plant in connection with the supply to Boddington, Staverton, Badgeworth, Shurdington, and Leckhampton.

Darwen.—A REVISED TARIFF.—A proposed new charge of 3¾d. per kWh for all energy over 330 kWh per quarter will benefit shopkeepers, &c., while for late window lighting, public lighting, and cinemas electricity is to be ¼d. per kWh cheaper. There is also a graded reduction for industrial power users. These proposals, if approved, will cost the Electricity Department £1,400 a year.

EXTENSIONS.—The Electricity Committee is to give a supply of electricity to the districts of Spring Vale, Bull Hill, Hoddlesden, and Waterside.

Droylsden.—STREET LIGHTING.—The Urban District Council is to have electric lighting installed in a number of new or unlighted roads and on a bus route at present lighted by gas. The installation is to be carried out by the Manchester Electricity Department.

Durham.—SCHOOL LIGHTING.—The Board of Education has sanctioned the installation of electric lighting in the Middleton-in-Teesdale Council School, Washington Glebe Council School, Washington Colliery School, and Dunston Council School.

Glossop.—ELECTRICITY CHARGES.—The Urban Electric Supply Co. has informed the local authority that its shareholders are not getting any return whatever from Glossop. The company is endeavouring to popularise the two-part tariff, and until there is a greater consumption of current it will not be possible for the company to show a reasonable return on capital and to reduce prices.

Guernsey.—STATES TAKE OVER SUPPLY.—From the beginning of this week the States of Guernsey have taken over the electricity supply system in the island from the Guernsey Electric Light & Power Co., Ltd.

Guildford.—EXTENSIONS.—The Electricity Committee recommends extending the supply to Wood Street and elsewhere at a cost of £2,885.

High Wycombe.—OVERHEAD LINES.—A Ministry of Transport inquiry has been held by Mr. T. L. Paterson, respecting the application of the High Wycombe (Borough) Electric Light & Power Co., Ltd., for permission to use overhead lines in Castleford Road, Sands.

Hockliffe.—STILL WAITING FOR ELECTRICITY.—The failure of Luton Corporation to provide an electricity supply, despite the fact that it was promised in July, 1932, after negotiations dating from 1928, was the subject of strong comment at the last Parish Council meeting. All the Council cottages are wired ready for the supply. Wilstead is also subject to a similar delay.

India.—MANDI SCHEME PROGRESS.—Recent reports concerning the Mandi Hydro-Electric Scheme state that the city of Amritsar is already receiving a supply, and by the end of this month eight more important towns will be electrified, including Lyallpur. It is understood that after watching the progress of electrification of these towns for about six months under the scheduled rates the Government will consider further extensions.

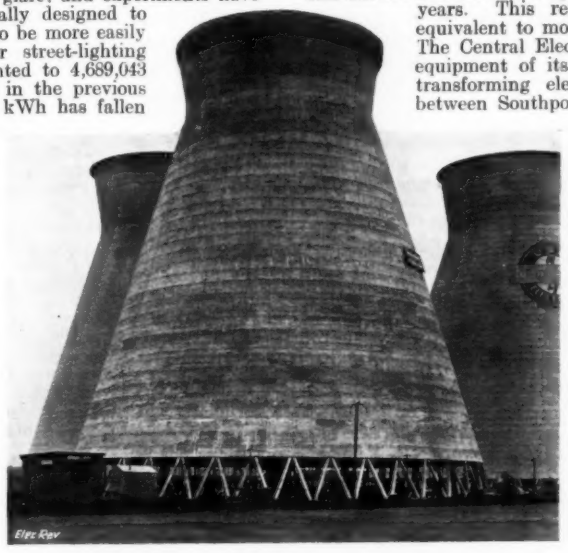
Kelbrook.—PROSPECTS OF SUPPLY.—Every effort is being made to speed up the provision of electricity to Kelbrook. Mr. J. Berry, chairman of Earby Electricity Committee, said that they were dependent on a h.p. supply from Nelson Corporation, who had to obtain wayleaves.

Langwathby.—STREET LIGHTING SCHEME ABANDONED.—The proposal to light the streets by electricity has been abandoned for the time being.

Leicester.—LOANS.—The Electricity Committee is applying for sanction to loans of £50,000 for sub-station extensions and £20,000 for unspecified works.

Liverpool.—STREET LIGHTING REPORT.—In his annual report Mr. P. J. Robinson, the city lighting engineer, states that during the year ended March 31st last there was an increase

of fourteen miles in the streets lighted, bringing the total up to 893 miles; of this distance 237 miles (against 217 miles in 1931-32) are illuminated electrically. A large number of street lighting improvements have been carried out, and it is the general practice not only to substitute electricity for gas wherever possible, but to improve the standard of illumination by reducing the spacing between the lamps and increasing the illuminating power. Mr. Robinson says that the operating costs of an electric street-lighting installation, including replacement of lamps and weekly cleaning, are 11.8 per cent. less than the most efficient scheme for a gas installation, including cleaning of lamps and burners and replacement of mantles. Good progress has been made with improved visibility and the elimination of glare, and experiments have been made with a fitting specially designed to enable policemen on point duty to be more easily seen. Electricity consumed for street-lighting purposes during the year amounted to 4,689,043 kWh, as against 4,345,465 kWh in the previous year, and the average price per kWh has fallen from 1.33d. to 1.202d., while the total charge for electrical energy amounted to £23,484.



One of the new water cooling towers in course of construction at the Brimsdown "B" station of the Northmet Co.

London. — BERMONDSEY.—The Electricity Committee recommends the adoption of a two-part tariff for domestic consumers with a "unit" charge of ¾d. and an annual fixed charge (payable quarterly) as follows:—Part occupation of house, £2; flat with separate entrance, £2 10s.; two-floor house (one family), £3; three-floor house (one family), £3 10s. It may be necessary in meeting cases having peculiar features to quote fixed charges other than the above. The new tariff is also to be available for consumers under the free wiring scheme, a certain quantity of electricity being charged for at a higher rate.

FULHAM. — The electricity undertaking had a surplus of £25,060 last year, as compared with £27,554 in the previous year.

A new sub-station is to be erected in Fulham Palace Road (£695).

ST. MARYLEBONE.—The Building Committee of the Royal Institute of British Architects has decided to adopt electricity for heating the new institute to be erected in Portland Place.

Maidstone.—CHEAPER ELECTRICITY.—The Town Council has made the following reductions in charges:—Power, flat rate, from 2d. to 1½d. per kWh. Power, two-part tariff, 6s. per kVA, with a "unit" charge of ¾d. (1d.). General two-part tariff, from 7s. per 30-W lamp per annum and 3 or 9 kWh at 1½d. and balance ¾d. or 1d., to 6s. 8d., ¾d. and 1d. for all units summer and winter respectively. Domestic all-in rate, from 7s. per 30-W lamp per annum and ¾d. per kWh in the summer and ¾d. in the winter, to 6s. 8d., and ½d. all the year. Domestic lighting flat rate, from 4½d. to 4¼d. per kWh.

Manchester.—PROGRESS IN MAY.—During May an increase of 3,162 kW in connections was recorded by the Electricity Department, making a total of 534,668 kW. There were also 2,155 applications for supplies (including additional supplies), representing a total of 4,236 kW. New cookers connected numbered 220, making 11,479 on circuit, while orders received for the hire of cookers amounted to 200. At the end of May there were 447 hired wash-boilers on circuit, seventeen having been connected during the month.

Northampton.—NEW SUB-STATION.—The Northampton Electric Light & Power Co., Ltd., is to erect a sub-station in Cranmere Avenue.

Portland.—NEW MAINS.—The Urban District Council is to duplicate e.h.p. mains (£4,345).

Sheffield.—STREET LIGHTING REPORT.—In spite of an increase of 441 during the year in the number of electric and gas lamps in use (making a total of 20,639), the Lighting Department reports an approximate net expenditure of only £57,328 for 1932-33—the lowest figure for seven years; for 1931-32 the expenditure was £62,572. Owing to financial stringency minor improvements only have been carried out during the year, the only important new lighting installation being at Barker's Pool and the streets around the new City Hall. The total candle power of the street lamps has been increased from 2,352,302 to 2,405,886.

LOANS SANCTIONED.—Sanction has been received to loans of £200,000 for services and £75,000 for wiring consumers' premises.

Shipley.—UNDERGROUND CABLE.—The Electricity Committee is to lay an underground cable to supersede the overhead line at the Cottingley Cliffe district (£180).

YEAR'S WORKING.—A net profit last year of £1,414 is reported by the Electricity Department.

Southampton.—HIRE OF WATER-HEATERS.—The Electricity Committee has applied for sanction to a loan of £2,500 in connection with a scheme for hiring electric hot-water storage tanks.

South Shields.—COMMISSIONERS AND "RAIDED" RESERVE FUND.—The Town Council has been instructed by the Electricity Commissioners to return to the Reserve Fund of the electricity undertaking the sum of £18,000 appropriated in March last for the relief of rates.

Southport.—LARGE REDUCTION IN GENERATING COSTS.—Mr. E. Moxon, the borough electrical engineer, in his annual report, states that the total works costs were the lowest on record and showed a reduction of approximately 60 per cent. in eight years. This reduction in generating costs is equivalent to more than the net profit (£20,588). The Central Electricity Board has completed the equipment of its sub-station for controlling and transforming electricity for reciprocal supplies between Southport and other selected generating stations. During the next few years the distribution system will have to be considerably strengthened and increased.

Stafford. — MAINS EXTENSIONS.—The Electricity Committee is to extend mains (£3,300).

Stoke-on-Trent. — EXTENSIONS.—The Electricity Committee has approved a general scheme for supplying the Hamil Road and Moorland Road areas, Burslem (£1,300).

SUN-RAY LAMPS FOR BATHS.—It is proposed to provide sun-ray lamps at the Hanley baths (£100).

REDUCED CHARGES.—Ordinary lighting charges have been reduced from 5d. to 4d. per kWh, and prepayment supplies from 7d. to 6d. per kWh.

Stone (Staffs.). — CHEAPER ELECTRICITY. — The general lighting rate has been reduced from 8d. to 7d. per kWh, and the minimum charge from 11s. 3d. to 8s. 9d. per quarter in the winter and from 7s. 6d. to 5s. 10d. in the summer. The multi-part tariff is also revised.

Sunderland.—A SUCCESSFUL YEAR.—The Corporation electricity undertaking's report for the year ended March 31st shows an output of 32½ million kWh—9 per cent. more than in the previous year. The number of consumers increased by 1,125, and the revenue at £189,571 was £13,050 higher. There was a net surplus of £1,176, as against a deficit of £8,320. This result was achieved in spite of a contribution of £11,114 to the relief of the rates.

Timberland (Lincoln).—ELECTRICITY NEXT WINTER.—The village is to have electric lighting before next winter, probably in the early autumn.

Tummelbridge.—POWER STATION PROGRESS.—Excellent progress is being made with the Grampian Electricity Supply Co.'s hydro-electric scheme for the provision of a second power station at Tummelbridge as complementary to the works already completed at Bridge of Ericht, on the north shore of Loch Rannoch. Water is being provided from Loch Rannoch, for the control of which a "regulation" dam is being constructed at the mouth of the River Tummel as it emerges from the Loch. A huge concrete dam has been constructed to form a large lake, whence water will be conveyed to the power station along a three-mile canal to Tummelbridge from which it will be carried to the station in pipes of 12 ft. diameter.

West Lancashire.—SUPPLIES FOR ALTCAR HOUSES.—The Rural District Council has given the Formby Urban District Council permission to supply 350 houses to be erected in the parish of Altcar near the Formby boundary.

Wood Green.—ELECTRICITY FOR HOUSING ESTATE.—The North Metropolitan Electric Power Supply Co. states that it is prepared to install electric lighting in the houses on the White Hart Lane Estate on the understanding that not less than 70 per cent. of the tenants decide to take a supply. The Electricity Committee considers that the rates submitted by the company for the installation work are excessive, and recommends negotiating further.

York.—REDUCED CHARGES FOR ALL-ELECTRIC HOUSES.—The Electricity Committee proposes to reduce the standing charge of 10d. per week per house for electricity supplied to all-electric houses on the housing estates to 9d. per week for four-bedroomed houses, to 8d. per week for three-bedroomed houses, and to 7d. for two-bedroomed houses.

LOAN.—Sanction is being sought to loans of £1,833 to complete the transmission line between the villages of Stillington and Sheriff Hutton, and £5,000 for sub-station plant.

ELECTRIC HEATING OF OFFICES.—The Electricity Committee is to install electric heating at the Clifford Street offices (£384).

Traction

Australia.—PROPOSED TRAMWAY RECONSTRUCTION.—The Victoria Electricity Commission has applied for funds for the complete reconstruction of the Bendigo and Eaglehawk tramways system.

Birmingham.—YEAR'S WORKING.—The gross revenue from the trams last year was £1,184,076 (decrease £80,882), buses £941,750 (increase £17,528), and trolley-buses £23,152 (decrease £1,844); the total revenue was £2,148,978 (decrease £65,198). The Tramway and Omnibus Committee states that the year has again been a difficult one, due to the continued trade depression, and the development of the housing suburbs in the outlying districts, necessitating a large number of vehicles to meet the heavy morning and evening peak loads, has caused the operating costs to exceed receipts.

Blackburn.—TRAFFIC SIGNALS.—The Corporation has decided to install automatic traffic signals at three additional points in the borough.

Blackpool.—NEW TRAMS.—The Transport Committee is purchasing a number of Pullman trams similar to the one just put into commission on the Blackpool-Fleetwood Promenade route. These new trams, which have been designed by Mr. W. Luff, Blackpool's transport manager, and cost £2,000 each, are intended to speed up the Fleetwood service, a maximum of 40 m.p.h. being obtainable.

High Wycombe.—TRAFFIC CONTROL.—The Town Council is to have automatic traffic signals installed at the Guildhall (£661) and Desborough Road (£565).

Irish Free State.—A SECOND DRUMM TRAIN.—The second train consisting of two large coaches driven by Drumm storage batteries is to be put into operation on the East Coast service of the Great Southern Railway Co. within the next few days. Arrangements are made so that if necessary the new train may be linked up with the original two-coach train, together with an additional coach, making one five-coach train with accommodation for 350 passengers and a touring radius of 120 miles.

Northampton.—YEAR'S WORKING.—The Transport Department showed a loss last year of £3,647—£1,561 less than was estimated in February.

Sheffield.—YEAR'S WORKING.—The Corporation tramways made a net profit of £13,926 last year. Working expenses amounted to £591,185, and the total income was £800,428, a decrease of £24,446.

Spain.—UNIFICATION OF BARCELONA RAILWAYS.—A project for the unification of all railway lines within the city, and for their electrification within a radius of about forty miles, has been approved by the Spanish Minister of Public Works, says *The Times*. The State, the Catalan Government, and the municipality will share the cost, which is estimated at 142,000,000 pesetas (about £3,550,000), and the project will require from ten to twelve years to complete. By this project two of the most important Spanish trunk lines, the Madrid or M.Z.A. line, and the Norte, which goes to Bilbao and other points on the northern coast, will, within the city, become part of a single electrified system, which will also include local railways and the two urban underground systems. The trunk lines will be electrified as they approach the city.

Sunderland.—FUTURE OF TRANSPORT UNDERTAKING.—Mr. C. A. Hopkins, general manager of the Transport Department, has presented to the Transport Committee a comprehensive report on the future development of the transport undertaking. Extensions of the tramway system are suggested, but only when the districts concerned are fully built up and there is a reasonable prospect of the new tramway being remunerative. Until then Mr. Hopkins suggests opening new bus services.

Surrey.—TRAFFIC SIGNALS.—Automatic traffic signals are to be placed at eight additional points in the county (£4,606), including installations at Kingston-on-Thames (£794), Merton (£584), and Cheam (£466).

United States.—TRAMCAR DEVELOPMENT.—Through the co-operation of twenty-five of the United States tramway companies, $500,000 has been expended on experiments over two years in an effort to produce a more comfortable and efficient tramcar. *Modern Transport* states that the vehicle is now being demonstrated in New York.

ELECTRIC LOCOMOTIVE STANDARDISATION.—A very complete scheme of standardisation has been evolved by the Pennsylvania Railroad for the 266 new locomotives required for the New York-Washington electrification scheme. Although the two passenger types have spring-borne motors with individual axle-drive, and the freight class nose-suspended motors, the armatures and stators of all are identical, except that the freight locomotive armature shaft has a slightly larger pinion bearing. The stators are pressed into any motor frame required. Also standard among the three types are the master controllers, air-compressors and motors, unit switches, pantographs, blower motors, and relay systems, while the transformers and preventive coils of the freight and slow passenger locomotives are the same. Furthermore, all the locomotives are built to interchangeable limits, so that any armature, brush-holder, transformer, stator, control unit, &c., will go on any locomotive in the series. The line current is 11,000 V single-phase, and the express passenger locomotives are of 3,750 h.p., the slow passenger and freight machines being rated at 2,500 h.p.

Communications

Australia.—WIRELESS ROYALTIES.—Up to March 31st the total amount paid by the Australian Government to Amalgamated Wireless (Australasia), Ltd., under the agreement made in 1927 was £464,361, of which £260,997 was for patent royalties and £203,363 for the operation of the coastal and island radio services. The Postmaster-General, in making this statement, said that the actual value of the patents was unknown, but they appeared in the company's balance-sheet on June 30th, 1932, at £93,000. For 1931-32 the sum of £51,455 was paid for patent royalties and £36,910 for the coastal and island radio services. The Commonwealth had received dividends amounting to £26,250 from the company for 1931-32.

Great Britain.—RADIO RELAY SERVICES.—The Gosport Town Council has granted the sole right to operating a relay service to the Hampshire Electrical Co., of High St., Gosport, on a ten years' agreement. The cost of the receiving and retransmitting station will be about £3,000.

The Hamilton Town Council has refused an application by Wireless Services, Ltd., for permission to install a service.

The Kilmarnock Town Council has given permission to the Ayrshire Wireless Service, Ltd., to establish a service for a period of ten years from June 15th.

The Weybridge Urban Council has granted wayleave concessions to British Concessions, Ltd., for the establishment of a service.

The Guildford Highways Committee has refused to grant British Concession, Ltd., wayleaves for wires over streets for a proposed rediffusion system.

The Highways Committee of the Sedgley U.D.C. is considering an offer by the Midland Rediffusion Service, Ltd., which is installing a service in Wolverhampton.

The Bournemouth Roads Committee has deferred an application for permission to operate a service in the borough.

The Cardiff Electricity Committee has asked the Parliamentary Committee to include in the next Bill to be promoted, a clause empowering the Corporation to provide and operate a service in the city.

The Barking Electricity Committee has considered an application from London Radio Development Services for the sole concession to operate a relay station in the borough. The borough electrical engineer is to report on the Middlesbrough Corporation's Bill in Parliament this session under which it is seeking powers itself to provide such a service in connection with its electricity undertaking.

A wireless relay concession has been granted by Higham Ferrers Town Council to Mr. W. A. Fathers, of Wellingborough.

Hull.—TELEPHONE PROFIT.—The Corporation's telephone undertaking, the only one in this country controlled by a municipality, made a profit of £17,434 last year.

Irish Free State.—WIRELESS SERVICES.—In Dail Eireann last week, Mr. G. Boland, Minister for Posts and Telegraphs, moved an estimate of £43,530 for broadcasting services for the current year. This figure, he said, compared with £60,310 for the year 1932-33. The decrease of £16,780 was due to the fact that the cost of the high power station at Athlone had been almost cleared last year. The original estimate of the Athlone station's cost, including buildings, was £70,000. The actual total cost would probably be slightly less. The revenue derived from wireless receiving licences last year was £17,296; customs duties on wireless apparatus amounted to £64,682, which included £12,000 for plant for the Athlone station. Revenue obtained from advertising and miscellaneous receipts came to £220, and this made the gross revenue £82,918. Revenue for the current year was estimated at £88,000, *viz.*, £20,000 for licences, £50,000 for Customs duties, and £18,000 for advertising programmes. The number of radio receiving licences issued last year was 33,083, an increase of 4,438. Expenditure on broadcasting services last year amounted to £87,945, including £46,000 for the Athlone station, thus leaving a deficit on the year's working of £5,747. Expenditure on broadcasting services for the current year was estimated at £55,000. The estimate was passed.

TELEPHONE AND TELEGRAPH SERVICES.—On a vote of £1,344,564 for the Department of Posts and Telegraphs, Mr. Boland said that the telephone service made a profit of £39,289, and the telegraph service a loss of £89,000 during the year 1931-32. The telegraph service was maintained because it was an essential service, and losses on it had been considerably reduced.

Scotland.—"TRUNKS ON DEMAND."—Beginning on July 1st, telephone subscribers in the Edinburgh automatic area have had the benefit of the new "trunk on demand" service. By improving and rearranging local conditions and in certain cases, where necessary, increasing the line plant—it is surprising how small an increase has been required in the number of trunks to give this facility—it is now possible to give practically a no-delay service between certain trunk zones. The benefits of the "trunk on demand" service will be given to the Glasgow area on August 5th.

South Africa.—TELEGRAPH AND TELEPHONE DEVELOPMENT.—Out of loan funds to be spent by the South African Government during the current financial year, £400,000 is allocated to telegraphs and telephones.

Switzerland.—TELEPHONY.—The Swiss Government has lately voted a credit of 11,039,000 fr. (about £441,560 at par) for the establishment of new telephone lines and the purchase of telephone apparatus during the next financial year.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—September 12th. Posts and Telegraphs Department. Automatic telephone switching equipment. (A.Y. 11848.)*
August 1st. Adhesive insulating tape. (A.Y. 11868.)*
September 12th. Four radio broadcasting stations at Townsville, Grafton, Sale and Launceston. The first two are to have an initial power of 5 kW each, with an ultimate power of 20 kW, while the others will have initial and ultimate powers of 2 and 10 kW.—*Tenders.*
August 14th. City Council. Fibre or glazed stoneware conduits. City electrical engineer (deposit £1 1s.).

Bedford.—July 24th. Electricity Department. Transformers. (See this issue.)

Belgium.—BRUSSELS.—July 12th. Commune de Saint Gilles-lez-Bruxelles. 6,000 m. of 750-V, d.c. armoured cable of 10 sq. mm. section. Particulars for 5 francs from Service de l'Electricité, 40, Rue Fernand, St. Gilles, Brussels.

Caithness.—July 17th. Commissioners of Northern Lighthouses. Fog signal installations at Stroma and Buchanness lighthouses. Mr. Stevenson, engineer, 84, George Street, Edinburgh (deposit £2 2s.).

Colchester.—July 24th. Royal Eastern Counties Institution, Ltd. Electrical installation at new home for mentally defectives. (June 30th.)

Darlington.—July 10th. Corporation. Trolley vehicles. (June 23rd.)

Dunfermline.—July 19th. Town Council. Various works, including electric lighting, at forty-four houses. Mr. D. H. Shaw, burgh engineer (deposit £1 1s.).

Ebbw Vale.—July 18th. Electricity Department. 300-kW glass bulb type mercury vapour rectifier. (See this issue.)

Edinburgh.—July 14th. Corporation. Installation of electric lighting in a ward at the City Hospital, Colinton Mains, and installation of electric lighting and power in extension to Nurses' Home, Bangour Mental Hospital, Dechmont Village, Broxburn. Engineer's Office, Dewar Place (deposit £1 1s. each section).

Farnworth.—July 10th. Electricity Department. Cables and 300-kVA transformer. (June 30th.)

Fife.—July 10th. County Council. Various works, including electric lighting, at twenty houses at Kincardine. Messrs. John Fraser & Son, architects, 3, Randolph Street, Dunfermline.

India.—SIMLA.—August 14th. Indian Stores Department. Electric lamps. (A.Y. 11853.)*
BOMBAY.—July 17th. Bombay, Baroda and Central India Railway Co. Electric lamps. (See this issue.)

Midlothian.—July 8th. County Council. Electrical installation at new school at East Calder. County architect, 10, Drumsheugh Gardens, Edinburgh.

Mold.—July 8th. Urban District Council. Wiring installations in twenty houses at Clay Lane. Mr. R. Stewart Kelly, clerk to the Council, Town Hall.

London.—ISLINGTON.—August 9th. Electricity Department. H.p. switchgear and other accessories. (June 30th.)

New Zealand.—CHRISTCHURCH.—August 8th. Electricity Department. 11,000-V sub-station switchgear. (A.Y. 11841.)*

Portland.—July 15th. Electricity Department. E.h.p. cable, truck type switchgear and meters. (June 30th.)

Portuguese East Africa.—LOURENCO MARQUES.—August 25th. Port and Railway Administration. Five floodlighting projectors (8,800 c.p. each). (A.Y. 11860.)*

Rugby.—July 11th. Town Council. Electric wiring at 100 houses. Town clerk.

South Africa.—JOHANNESBURG.—July 13th. City Council. Fifty 50-, 100-, 150- and 200-kVA oil-immersed power transformers. (A.Y. 11857.)*
CAPETOWN.—August 30th. Electricity Department. Oscillograph, &c. (A.Y. 11869.)*
DURBAN.—September 29th. Town Council. Twenty-two double-deck trolley-buses. Messrs. Webster, Steel & Co., 9, St. Helen's Place, Bishopsgate, London, E.C.3 (deposit £3 3s.).
July 14th. Telephone cables (A.Y. 11844)* and telephone wires and apparatus (A.Y. 11845)*.

Stockton-on-Tees.—July 19th. Electricity Department. H.p. outdoor type switchgear and transformer kiosk. (See this issue.)

Turkey.—ISTANBUL.—August 16th. Department of Posts, Telegraphs and Telephones. 150 tons of iron telegraph wire. (G.Y. 12748)*.

Upton (CHESHIRE).—July 10th. Mental Hospital Visiting Committee. Electric lighting and power equipment at the Mental Hospital. Messrs. Sloan & Lloyd Barnes, consulting engineers, 34, Castle Street, Liverpool (deposit £2 2s.).

Wallasey.—July 10th. Victoria Central Hospital. Electrically driven booster for hot water circulation. Secretary, Mr. A. J. Aust (deposit £2 2s.).

West Riding.—July 10th. Education Committee. Installation of electric lighting at Askern Moss Road new infants' school. Education Officer, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aberdeen.—Town Council. Accepted. Electrical work, King Street housing scheme (£1,382).—J. B. Reid.

Ardrossan.—Town Council. Accepted. Electric lighting installation at Dalry Road housing scheme.—W. and F. Rogers.

Barking.—Education Committee. Recommended. Electric lighting and heating at the Dorothy Barley school. Lighting (£1,110).—Harland & Wolff, Ltd. Heating equipment (£3,672).—E. Fletton & Co., Ltd.
Electricity Committee. Recommended. Switchgear (£687).—Allen West & Co., Ltd.

Chesterfield.—Electricity Committee. Accepted. E.h.p. cable (£498).—Macintosh Cable Co., Ltd. Transformer kiosks (£322). Brush Electrical Engineering Co., Ltd. E.h.p. switchgear (£181).—Switchgear & Cowans, Ltd.

Dover.—Town Council. Accepted. Transformers (£854).—British Electric Transformer Co., Ltd. Rewiring Maison Dieu House (£99).—E. Wright & Son.

Durham.—County Education Committee. Accepted. Installation of electric lighting at the Eldon Council school.—Devereux, Moodie & Co., Ltd.

Hull.—Education Committee. Accepted. Electrical installation, Mersey Street School (£552).—Booker & Tarran.

London.—METROPOLITAN WATER BOARD.—Accepted. Water turbine, pump and electric generator for Briston works (£250).—Gilbert Gilkes & Gordon, Ltd.

Luton.—Town Council. Accepted. Automatic traffic signals (£638).—Automatic Electric Co., Ltd.

Middlesex.—Highways Committee. Recommended. Traffic signals for the Great West Road and North Circular Road (£4,968).—Automatic Electric Co., Ltd.

Morecambe.—Electricity Committee. Accepted. Two 200-kVA transformers.—Electric Construction Co., Ltd.

South Africa.—JOHANNESBURG.—Finance Committee. Recommended. Three double-deck tramcars (£10,336), and two double-bogie double-deck tramcars (£4,142 each).—Vickers & Metropolitan Carriage (South Africa), Ltd.

Stoke-on-Trent.—Electricity Committee. Accepted. Overhead wiring and services at housing estates (£1,028).—E. Holloway. Change-over of supply, N.E. Technical College (£422).—Barnett & Soans.

Notes

The Reconstitution of E.D.A.

An extraordinary general meeting of the British Electrical Development Association will be held at the Savoy Hotel on Friday, July 21st (3 p.m.), when resolutions will be submitted effecting the reconstitution of the Association on the lines proposed. (See our issue of June 9th, page 819.)

A Specification for Tubular Lamp Fittings

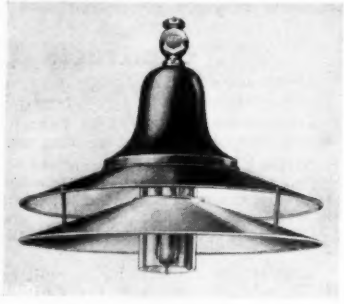
The British Standards Institution has issued a new Specification (No. 495-1933) entitled "Fittings for Double-Capped Tubular Lamps." Under this heading will be recognised the well-known trough reflector, generally of aluminium, which carries single filament tubular lamps, capped at both ends, end to end. A modern development is the use of these lamps in "architectural lighting" devices, such as luminous panels in line form, whilst still more recent are the decorative fittings wherein artistic combinations of the "line source" are a feature of the fittings. All of these fittings are covered by the Specification. E.L.M.A. has standardised the dimensions for the lamps. Lamp caps must be insulated, thus barring Continental lamps. Limits of pressure are specified for plunger springs and all live contacts are to be protected from accidental contact. Fittings must be earthed and tested before issue with specified length gauges. In most of these fittings, in order to shorten the space between the lamps, each lampholder contains a single spring plunger contact which is common to both adjacent lamps, so that there is one fixed contact and one movable contact to each lamp. The Specification is limited to this type of fitting. Copies of the Specification can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1 (price 2s. 2d. post free).

A New Moulding Composition

According to *Elektrotechnische Zeitschrift*, a new moulding composition developed by the H. Römmler A.G. combines impact-resistance strength exceeding that of cast iron with high insulating value and complete resistance to moisture, salt spray, ammonia, and acid fumes. The composition consists of synthetic resin and linen in the form of shreds and it is claimed that, unlike the "hard linen" compounds hitherto available, the new material can be pressed into complicated shapes. The following data are given: sp. gr. 1.5; minimum bending strength, 700 kg. per sq. cm. (9,954 lb. per sq. in.); impact resistance value, 15 cm. kg. per sq. cm.; heat resistance, 125 deg. C.; breakdown strength (5 mm.), 40,000 V.

Special Lighting at Torquay

During the E.C.A. Conference demonstrations of the new "Osira" systems of colour flood and street lighting have been well in evidence, thanks to the interest taken in the Conference by the borough electrical engineer, Mr. G. J. Hollyer, A.M.I.E.E. The main front of the Town Hall is flood-lighted in red, while the tower is picked out in blue by a powerful battery of the new "Osira" radiant colour floodlights. Another feature is the lighting of the promenade, specially designed G.E.C. lanterns accommodating 420-W "Osira" lamps being suspended in pairs from the tramway poles above the 88-ft. wide thoroughfare. One of these is illustrated.



The new "Osira" lantern used at Torquay

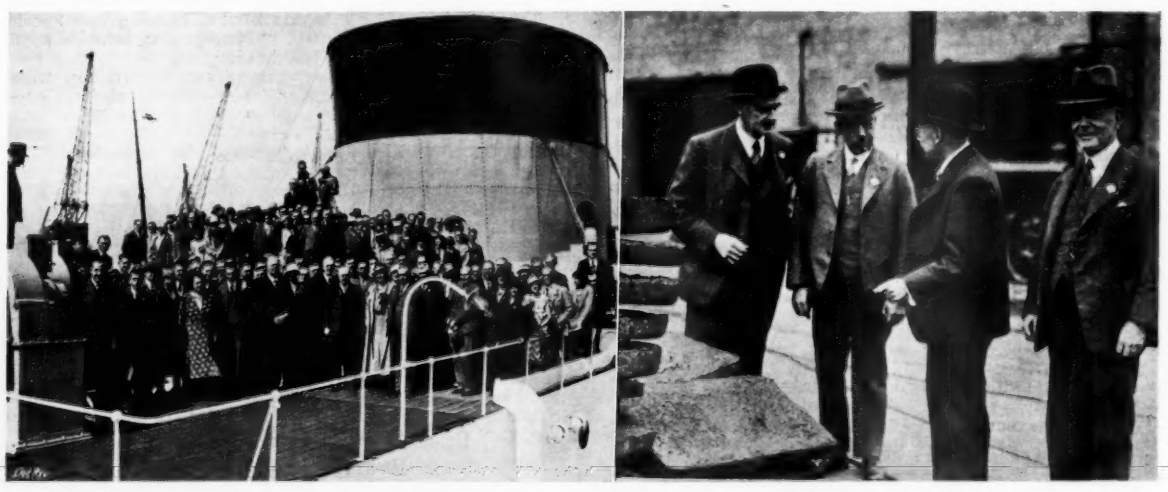
The General Electric Co., Ltd., in collaboration with Torquay contractors, has also staged a large number of telling displays designed to stimulate interest in the application of electric lighting, heating, cooking, and power for shops and stores, offices, factories, churches, and cinemas, as well as for industrial and domestic purposes.

Water Heating

Mr. P. J. Robinson, city electrical engineer, Liverpool, on June 28th lectured at Manchester on water heating by electricity, his audience being engineers and others interested in installations. Mr. H. C. Lamb, city electrical engineer, Manchester, presided. Mr. Robinson discussed methods of heating by electricity, types of elements, automatic control, methods of fixing, the insulation of cylinders, and numerous other technical points. The thermal insulation adopted at Liverpool had the merits of simplicity, cheapness, and efficiency at low temperatures. It consisted of about six layers of corrugated cardboard wrapped round the cylinder and covered by canvas, which, when sewn, had a very neat finish. The presence of air ducts through the corrugations increased the insulation efficiency, since the air so contained itself served as an ideal insulator. In Liverpool there were approximately 3,000 water-heating installations. In view of the fact that with an approved type of heat storage apparatus, electricity was supplied for water heating at a reduced rate, special meters were installed and it was therefore possible to give the actual annual consumptions for a number of houses. They ranged from 1,843 kWh for a house assessed at £18, to 11,185 kWh for a £56 house, the mean for twenty houses of an average assessment of £54 being 7,733 kWh per annum.

Mining Electrical Engineers' Conference

The annual convention of the Association of Mining Electrical Engineers was held at Blackpool from June 26th-30th, and on June 27th over 170 delegates took advantage of the invitation of British Insulated Cables, Ltd., to visit their Prescot works. The whole of the day's programme was provided by the B.I., the delegates being conveyed from Blackpool by a fleet of motor coaches to the works. After a tour of the works the party were entertained to lunch at the Adelphi Hotel, Liverpool, with Mr. G. H. Nisbett, managing director of the company, in the chair. After lunch there were visits to various places which included Liverpool Cathedral, the works of the Automatic Electric Co., Ltd., and the White Star liner *Georgic*, tea being served on board, after which the party was conveyed back to Blackpool. Our illustrations show the delegates on the liner and a group at the works of British Copper Refiners, Ltd., including Mr. Nisbett and the president of the A.M.E.E.



The Mining Electrical Engineers' Convention: Left: On the *Georgic*, (right) at the new copper refinery

Appointments Vacant

Chief lady demonstrator for Exeter Electricity Department.

Mains engineer for Eastbourne Electricity Department.

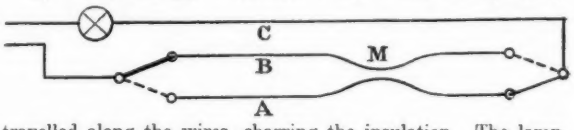
Lady showroom attendant and demonstrator for Leyton Electricity Department.

Chief electrical engineer for the Hammersmith Corporation Electricity Department.

(See our classified advertisements.)

Two-way Switching Faults

In a recent issue of *Revue Générale de l'Electricité*, L. Mager describes two cases of breakdown and potential fire risk resulting from the establishment of contact and continued arcing between two of the conductors in a two-way switching circuit. The first case was one of faulty installation, the wiring for a staircase lamp being arranged with the two wires A B in one of the grooves of a double-groove casing. Also, the casing was so placed as to be exposed to kicks, with the result that the cover was displaced and the wires A B bared and brought into sufficient contact to start a minute arc at M. When the lamp was burning the fault was not evident but, with the switches "off," there was 220 V between A and B and arcing slowly



travelled along the wires, charring the insulation. The lamp acted as a resistance, limiting the current flow, which was only sufficient to raise the filament to a dull red. In these circumstances the fuses obviously afforded no protection.

The second case, closely similar, related to a 110-V installation in which three-wire flex was used to provide two-way control at a pear switch. In this instance there was no question of faulty installation, but the insulation ultimately failed near the pear switch as the result of repeated bending. The subsequent course of events was as explained before. The risk in question is one which may arise wherever there are contiguous conductors in series with a current-limiting load, the wires being at the same potential when the circuit is closed, but at a difference of potential equal to the line voltage when the circuit is open.

Too Many Signs?

Major Leslie Roseveare, borough and building surveyor of Eastbourne, in his presidential address at the diamond jubilee conference of the Institution of Municipal and County Engineers at Eastbourne on June 28, said that there was an urgent necessity, before it became too late, to exercise what powers they had to preserve the amenities of business areas from an overdose of undesirable and sometimes inartistic advertising. The insidious, because it was intriguing, growth of electric advertisements was becoming all too evident in many towns. The introduction into dignified business areas of the glare, restless effect, and spoliation of good architectural elevations incidental to such displays was undesirable and should be kept within reasonable limits.

Makers' Names Wanted

"Bakelite" ceiling roses with vitreous interior screwed into the rose.

DENSOPIPE insulating material.

STARLIGHT electric gas lighter.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

I.E.E. Awards.—The Council of the Institution of Electrical Engineers has awarded the following premiums for students' papers for the session 1933-34:—Students' premiums (value £10): Messrs. C. J. W. Hill and H. Page, B.Sc.; H. Rissik, B.Sc., and H. M. Turner. Students' premiums (value £5): Messrs. H. W. Beara, S. Farrer, W. L. M. French, P. F. Gunning, N. Herwald, E. C. Rippon, P. J. Shipton, K. R. Sturley, Ph.D., B.Sc., and A. W. Weir.

Lord Falmouth has been elected vice-chairman of the London and Home Counties Joint Electricity Authority.

Mr. A. F. Harrison, formerly general manager and secretary of the City of London Electric Lighting Co., Ltd., has been appointed managing director of the company. Mr. Harrison, who was educated at Haileybury, joined the company in 1892, within six months of its formation. He was appointed assistant secretary in 1902, secretary in 1906, and general manager and secretary in 1931. He is a member of the Standing Committee of the London Electrical Supply Association, and represents that body on the Council of the British Electrical Development Association and the Conjoint Conference of Public Utility Associations. He is also a member of the Council of the Association of Superannuation and Pensions Funds. Mr. Harrison became a Fellow of the Chartered Institute of Secretaries in 1905, joined the Council in 1912, and was elected president for the year 1923-24. He is also managing director of the Bankside Investment Trust, Ltd.

[*Int. Rotogravure*
Mr. A. F. Harrison

Mr. J. A. Kinnaird, A.M.I.E.E., and **Capt. W. H. Pollen,** M.C., have been appointed directors of the Paterson Engineering Co., Ltd.

Mr. F. Lamb has relinquished his appointment as managing engineer with Messrs. Henry Barker, Ltd., and has commenced business on his own account as electrical engineer and contractor at Parade Chambers, South Parade, Nottingham.

Mr. D. H. Nye, general manager of the Anglo-Argentine General Electric Co., Ltd., Buenos Aires, will arrive in London about the middle of the current month. While in England Mr. Nye's address will be c/o the General Electric Co., Ltd., Export Department, Magnet House, Kingsway, W.C.

[*Guttenberg, Manchester*
Mr. C. H. Rayner

Mr. C. H. Rayner, sales manager of the Manchester Corporation Electricity Department, acting on medical advice, is to retire on September 6th, after more than thirty-seven years with the Corporation. Mr. Rayner was born at Bolton in 1870, and was educated at Ducie Avenue School and the Manchester Grammar School. He was engaged in 1896 by the late Mr. C. H. Wordingham, then the chief engineer of the Electric Light Department, and after a few years' experience was put on the "road" to obtain business, a difficult job in the early pioneer days. By perseverance, however, he induced many people to change over to electricity for lighting and power, and several of the oldest power users remember Mr. Rayner's efforts to persuade them to use electricity. In 1922, Mr. Rayner was chairman of the Manchester Branch of the Incorporated Sales Managers' Association, and had the honour of being presented to the Prince of Wales at the annual banquet in London. Mr. Rayner asks us, on his behalf, to say *au revoir* to his many friends in the electrical profession, particularly those whom he has met at the E.D.A. conferences, at one of which he read a paper on "The Development of Electric Cooking."

Mr. D. Dempster, of Downfield, Dundee, has won the senior scholarship in electricity, valued at £350, awarded by the trustees of Sir James Caird's Travelling Scholarships Trust.

Mr. F. A. East, B.Sc., A.K.C., A.M.I.E.E., who for many years past has been identified with the sale of "Sangamo-Ediswan" meters on behalf of the Edison Swan Electric Co., Ltd., has now joined the British Sangamo Co., Ltd., to continue his activities with the actual makers. The selling arrangement between the Edison Swan Electric Co., Ltd., and the British Sangamo Co. terminated on June 30th.

[*Elliott & Fry*
Mr. F. A. East

Mr. J. Beresford Campbell has been appointed secretary to Mr. J. H. Williams, managing director of the Marconiphone Co., Ltd. Mr. Campbell was formerly personal assistant to Mr. E. J. Emery, the company's service manager.

Lord Meston has been elected president of the Electrical Industries Benevolent Association for the ensuing year, and **Mr. Justus Eck,** M.A., M.I.E.E., has been appointed hon. secretary.

Capt. P. Dunsheath, of Henley's, is, we are pleased to learn, back at work after two months' illness. Capt. Dunsheath has had the degree of Doctor of Science (Engineering) conferred on him by the Senate of the London University.

Mr. A. A. Blackburn, late general manager and engineer to the Huddersfield Corporation Tramways, has been presented by the staff with a fitted wardrobe, and by the Tramways Social and Athletic Club with an oak timepiece.

Mr. William Fraser has been appointed managing director of Messrs. Johnson & Phillips, Ltd., in succession to Mr. H. J. Sheppard, who is retiring from active management at the end of this year after forty-five years' service with the company, for the last three years of which he has been managing director. Mr. Fraser received his early training in Glasgow, where he subsequently established, and acted as senior partner and managing director of, the well-known firm of Fraser & Borthwick, Ltd. This company specialised in the industrial field, and during Mr. Fraser's control of its interests was responsible not only for the electrification but in many cases for the complete layout of some of the largest industrial works in the country. Some years ago Mr. Fraser joined the boards of the Enfield Cable Works, Ltd., and the Enfield Rolling Mills, Ltd., as deputy managing director.

[*Lafayette*
Mr. William Fraser

Mr. H. S. Lewis, A.M.I.M.E., formerly Midlands representative of Messrs. Richardsons, Westgarth & Co., Ltd., has been appointed sales manager of Messrs. Richardsons, Westgarth-Brown Boveri, Ltd., with headquarters at the London office of the company, 56, Victoria Street, S.W.

Miss Joan B. Kennedy, late of the E.L.M.A. Lighting Service Bureau, has been appointed technical librarian to E.D.A.

Mr. J. B. Clarke, M.I.E.E., of St. Pancras Electricity Department, was presented on June 30th with an illuminated address on the occasion of his relinquishing his appointment. Mr. Robert Lee, the chief engineer and manager, made the presentation, and he was supported by representatives from the Town Hall, the heads of departments, and employés. The presentation included a suit-case and a silk umbrella.

Obituary

Mr. R. McCourt, A.M.I.E.E., mains engineer to the Harrogate Corporation electricity undertaking, died on June 30th. The funeral took place on Tuesday last and was attended by Electricity Department and Corporation officials and representatives of the Electrical Association for Women, the Institution of Electrical Engineers, the Electrical Power Engineers' Association, electrical contractors, and others. Mr.

McCourt received his early training with Messrs. Kelvin and White, and was mains assistant to the Paisley Corporation before taking up his appointment as mains superintendent to the Harrogate Corporation in 1902. He read papers before the Institution of Electrical Engineers, and for a paper read at the Sheffield conference of the I.M.E.A. in 1907 he was awarded the prize of that year.

Mr. H. A. Curtis, a well-known Australian electrical engineer, has died at Hobart, Tasmania. A native of New Zealand, he was engaged in the construction of the Lake Coleridge hydro-electric works. Going to Tasmania in 1916 he was engineer in charge at the erection of the original power station at Waddamanna. When Sir John Butters resigned from the Hydro-Electric Department in 1924 Mr. Curtis was appointed chief engineer and general manager, and in 1930, when the Hydro-Electric Commission was created, he became Commissioner, holding this position at the time of his death.

Mr. A. Davis.—The death occurred on June 21st, at the age of 75 years, of Mr. Alfred Davis, A.M.I.E.E., of Latchford Without, Warrington. For twenty-six years he was electrical engineer at the County Mental Hospital at Winwick, retiring in March, 1927.

Wills.—**Mr. F. Driver,** works manager of the Osram-G.E.C. Lamp Works, left £31,303 (net personalty £29,013).

Mr. George Tough, formerly manager of the Coventry Corporation electricity works, left £1,628.

Mr. A. H. Geldart, vice-chairman of the Northampton Electric Light & Power Co., Ltd., left £10,414 (net personalty £9,958).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Sun Vic Controls, Ltd.—Private company. Registered June 30th. Capital, £50,000 in £1 shares (35,000 6 per cent. cumulative preference and 15,000 ordinary). Objects: To adopt an agreement with R. A. Fulford; and to develop and turn to account the patents, privileges, trade marks, stock in trade and other assets mentioned therein. So long as Metropolitan-Vickers Electrical Co., Ltd., and the Sun Electrical Co., Ltd., respectively, hold 1,000 ordinary shares they may nominate two directors, and so long as Power Securities, Ltd., and Electric Furnace Co., Ltd., hold together a like number of ordinary shares they may nominate one director. R. A. Fulford may nominate a director while holding 1,000 shares. The first directors are: R. A. Fulford, R. J. Rawlings, W. S. Gifford, A. G. Beaver, P. S. Turner and A. S. Rinder. Registered office: 118, Charing Cross Road, W.C.2.

Bernard Windle, Ltd.—Private company. Registered July 1st. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in electrical accumulators, batteries, dynamos, motors, transformers, and electrical plant, &c. The directors are: B. Windle, 227, Barkerhouse Road, Nelson; and W. Roberts, Craigmore Blacko, Nelson. Registered office: 41, Chapel Street, Salford, Lancs.

Associated Utilities, Ltd.—Public company. Registered June 28th. Capital, £5,000 in £1 shares. Objects: To carry on the business of an electricity supply, gas and water company in all its branches, &c. The directors are: R. W. Edwards, Brooklands, Aldershot, Hants; T. A. Braddock, Werneth, Aldrington Road, Streatham Park, S.W.16; C. P. Crookenden, Woodridings, Horsell Rise, Woking, Surrey; and B. R. Green, Selsdon Park, Sanderstead, Surrey. Secretary (pro. tem.): F. A. Ricketts. Registered office: 92, Victoria Road, Aldershot, Hants.

Athco, Ltd.—Private company. Registered June 30th. Capital, £3,000 in 2,500 preference shares of £1 each and 10,000 ordinary shares of 1s. each. Objects: To acquire the business of tool manufacturers and manufacturers of radio products of all descriptions carried on by J. H. Payne, A. T. Harrison and G. H. Valentine at Kintore Works, Bermondsey, as "A. T. Harrison and Co." The directors are: J. H. Payne, 34, Grove Hill Road, S.E.5; A. T. Harrison, 41, Albany Road, S.E.5; and G. H. Valentine, 78, Clifton Hill, New Cross, S.E.14. Registered office: Kintore Works, Grange Road, Bermondsey, S.E.1.

Universal Electric Time & Telephone Systems, Ltd.—Private company. Registered June 29th. Capital £1,000 in £1 shares. Objects: To carry on the business of electrical contractors, electrical, mechanical, telephone, wireless and general engineers, manufacturers of and dealers in electric clocks and time recording machines, &c. The provisional directors are: W. T. Barrow, Wellington Buildings, Liverpool; J. R. Townley, 195, Queen's Drive, W. Derby, Liverpool; and W. Rose, The Orchard, Mawdesley, near Ormskirk. Secretary: J. R. Townley. Registered office: Wellington Buildings, The Strand, Liverpool.

Neon Moving Messages, Ltd.—Private company. Registered June 29th. Capital, £1,500 in £1 shares. Objects: To adopt an agreement between Geo. S. Shaw (inventor) and W. J. P. Dunne (for this company) to acquire the sole licence to operate certain inventions, and to carry on the business of sign makers, advertising specialists, &c. The directors are: W. J. P. Dunne, 52, Ferrars Avenue, W. Drayton, Middlesex; G. S. Shaw, 27, Knowsley Road, Wallasey, Ches.; and E. A. Sullock, Wirral View, Boundary Lane, Heswall, Ches. Registered office: 37-39, Oxford Street, W.1.

London Radio Development Services, Ltd.—Private company. Registered June 26th. Capital, £1,000 in £1 shares. Objects: To carry on a wireless relay service; to manufacture and deal in radio, sound reproduction and television sets, etc. The first directors are: A. H. Smith, 3, Park Parade, Harlesden, N.W.10, and R. D. Henderson-Davy, 116, Huron Road, Balham, S.W.17. Registered office: 5, John Street, Bedford Row, W.C.1.

Barnes-Heath & Co., Ltd.—Private company. Registered June 15. Capital, £100 in 5s. shares. Objects: To carry on the business of electricians, electrical, mechanical, radio and general engineers, exporters and contractors, manufacturers of and dealers in film manufacturing, producing, recording and projecting apparatus, &c. The directors are: Charles F. T. Heath, 4, Beechwood Avenue, Finchley, N.3; Reginald Barnes-Heath, 4, Beechwood Avenue, Finchley, N.3. Registered office: 45, Conduit Street, W.1.

Sidcup Electrical Co., Ltd.—Private company. Registered June 22nd. Capital, £700 in £1 shares. Objects: To acquire the business of an electrical engineer and electrician hitherto carried on by Chas. F. Thompson at 72, High Street, Sidcup, as "The Sidcup Electrical Co." The directors are: C. F. Thompson (permanent director and chairman), 38, Broomfield Road, Herne Bay, and two others. Solicitors: Reed & Reed, 1, Guildhall Chambers, E.C. Registered office: 72, High Street, Sidcup, Kent.

Elcap, Ltd.—Private company. Registered June 30th. Capital, £700 in £1 shares. Objects: To acquire the business of a manufacturer of and dealer in electrical domestic appliances now carried on by Leonard C. Capener at 23/5, St. Mary Street, Ladywood, Birmingham. The directors are: H. Flavell (chairman), 21, Mayfield Road, Handsworth, Birmingham; and L. C. Capener, 194, Weoley Castle Road, Selly Oak, Birmingham. Solicitors: Redfern & Co., 23, Colmore Row, Birmingham.

Returns of Electrical Companies

Veritys, Ltd.—Capital, £196,000 in 7,000 5 per cent. preference and 7,000 6 per cent. preference shares of £10, 7,000 preferred ordinary shares of £7 10s., and 70,000 deferred ordinary shares of 1s. each. Return dated October 13th, 1932 (filed January 7th, 1932). All shares taken up. £137,701 10s. paid on 4,670 5 per cent. preference, 7,000 6 per cent. preference, 2,800 preferred ordinary, and 30 deferred ordinary shares. £58,298 10s. considered as paid on 2,330 5 per cent. preference, 4,200 preferred ordinary, and 69,970 deferred ordinary shares. Mortgages and charges, £122,454.

Santon, Ltd.—Satisfaction in full on May 23rd, 1933, of mortgage dated April 16th, 1932, and registered April 27th, 1932. (According to the register of mortgages, the only charge registered April 27th, 1932, was a charge which originally secured all moneys due to bank not exceeding £500.)

Dawlish Electric Light & Power Co., Ltd.—Satisfaction (1) to the extent of £1,750 on June 15th, 1933, of first mortgage debenture for £2,000, dated July 25th, 1911, and registered August 15th, 1911, and (2) in full on October 18th, 1932, of third mortgage debenture for £500 dated September 24th, 1920, and registered October 6th, 1920. (Notices filed June 22nd, 1933.)

Watford Electric & Manufacturing Co., Ltd.—Satisfaction to the extent of £500 on May 31st, 1933, of debentures authorised May 31st, 1923, and registered June 11th, 1923. (According to the register of mortgages, the debentures registered June 11th, 1923, originally secured £4,000.)

Power Contracts (Batwin), Ltd.—Two debentures, dated June 14th, 1933, to secure £1,000 each, charged on the company's property, present and future, including uncalled capital. Holders: H. Constad, 102, Bridge Lane, Golders Green, N.W.11.

Crossley Bros., Ltd.—Capital, £1,492,293 in 403,390 preference shares of £1, 1,015,414 ordinary shares of 10s., and 581,196 unclassified shares of £1. Return dated March 14th, 1933. 403,390 preference and 1,015,414 ordinary shares taken up. £405,700 paid on 278,200 preference and 255,000 ordinary shares. £505,397 considered as paid on 125,190 preference and 760,414 ordinary shares. Mortgages and charges, nil.

Isle of Thanet Electric Supply Co., Ltd.—Capital, £500,000 in 282,000 6 per cent. preference, 150,000 ordinary, and 68,000 unissued shares of £1. Return dated March 24th, 1933. 282,000 preference and 150,000 ordinary shares taken up. £222,000 paid on 222,000 preference shares. £210,000 considered as paid on 60,000 preference and 150,000 ordinary shares. Mortgages and charges, £268,405.

Reliance Electrical Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1932 (filed May 19th, 1933). 300 shares taken up. £150 (10s. per share) paid. Mortgages and charges, nil.

Electroflo Meters Co., Ltd.—Capital, £21,000 in £10 shares. Return dated May 31st, 1933. 2,090 shares taken up. £10,900 paid. £10,000 considered as paid. Mortgages and charges, nil.

London Electric Service, Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 shares beyond the registered capital of £5,000.

Railway Signal Co., Ltd.—Satisfaction in full on June 1st, of £10,000 debentures authorised March 30th, 1897, and £6,000 debentures authorised October 15th, 1902, and registered April 16th, 1930.

Bakelite, Ltd.—Deposit on June 7th of deeds of factory, land and premises at Redfern Road, Yardley, Birmingham, to secure all moneys due or to become due from the company to Lloyds Bank Ltd., not exceeding £40,000.

John Bennie, Ltd.—Mortgage dated June 12th, to secure £2,100, charged on certain debts and sums due under certain contracts.—Holder: T. W. Hayes, 31, Bracken Gardens, Barnes.

Croydon Mouldrite, Ltd.—The nominal capital has been increased by the addition of £29,000 beyond the registered capital of £21,000. The additional capital is divided into 180,000 ordinary shares of 1s. each and 20,000 ordinary shares of £1 each. Upon such shares being allotted, all preference and ordinary shares are to be consolidated to make the present capital £50,000 in 50,000 ordinary shares of £1 each. Satisfaction to the extent of £5,000 on June 22nd, 1933, of debenture dated April 30th, 1931, and registered May 8th, 1931.

G. & L. Electrical Supply Co., Ltd.—A. I. Todman, Canada House, Norfolk Street, W.C.2, was appointed receiver on June 13th, 1933, under powers contained in debentures dated October 31st, 1929.

City Notes

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., has now issued details of the scheme for the rearrangement of its capital. It is proposed to reduce the capital from £1,250,000 to £650,000 by writing down the nominal value of the 750,000 ordinary shares from £1 to 4s. each. All arrears of the fixed cumulative preferential dividend and all rights to dividends accrued and to accrue on the preference shares to September 30th next will be cancelled, and from that date the rate of dividend will be increased from 5 per cent. to 5½ per cent., such dividend to be non-cumulative for two years. The 750,000 ordinary shares of 4s. each will be consolidated into 150,000 shares of £1 each and will be known as preferred ordinary shares entitled to a dividend of 6 per cent per annum and to 50 per cent. of the surplus profits (after 6 per cent. has been paid on the 100,000 new ordinary shares referred to below). The capital will then be increased to its former amount by the creation of 100,000 new ordinary shares of £1 each and 600,000 new shares of £1 each, the latter being issued from time to time with such preferential, deferred or other rights as the company in general meeting shall determine. The 100,000 ordinary shares will be issued for cash at par and be entitled to a non-cumulative dividend of 6 per cent. per annum and 50 per cent. of the surplus profit, and to ten votes per share thereby carrying the voting control of the company. The date of redemption of the £400,000 5 per cent. mortgage debentures outstanding, which fall due for repayment in 1936, is to be extended to 1972, and they will be redeemable by a cumulative annual sinking fund of 1½ per cent. commencing in 1935, with power to the company to redeem all the outstanding debentures or any part of them after 1940. A circular to shareholders outlines the events which have led up to the proposed scheme, and states that a conditional agreement has been arranged with the British Goodrich Rubber Co., Ltd., for the close working together of the two companies. Subject to the scheme becoming effective on or before November 15th next, or such later date as may be agreed upon, the British Goodrich Co. has agreed to subscribe, or procure subscribers, at par for the new 100,000 ordinary shares. The proposals will be submitted at an extraordinary general meeting to be held on July 27th.

The Nigerian Electricity Supply Co., Ltd., held its annual meeting on June 29th, Major E. S. Marks (chairman) presiding. In presenting the report and accounts (ELEC. REV., June 16th, page 889), the chairman said the electrical energy generated totalled 9,946,830 kWh, a falling-off of 1,770,730 kWh. This drop was accounted for by consumers being further restricted in their permitted output of tin. There had been a substantial rise in the price of the metal and a fall in visible stocks of tin, but until the International Committee raised the permitted quota output the demand for power could not increase. If the demand for tin from American consumers continued on the same scale as during the past few months, the Committee might find it possible to permit a larger production. Dealing with the reorganisation scheme, he said that it was proposed to reduce the capital of the Corporation from £650,000 to £500,000 by writing down the ordinary shares by £150,000. The ordinary shareholders had agreed to this reduction. It was proposed to make an issue of £220,000 6 per cent. first mortgage redeemable debenture stock. The proceeds would be utilised to purchase, *inter alia*, a hydro-electric station situated at the northern end of their transmission line.

Mirrlees, Bickerton & Day, Ltd., held their annual meeting on June 29th. Mr. C. Day (chairman and managing director), in presenting the report and accounts (ELEC. REV., June 16th, page 889), said, in referring to the company's Diesel engine business, that the year had again been one of intense and world-wide competition with prices extremely low, which emphasised the importance of reducing costs of manufacture. At present the number of sizes and types required militated against economic production, and it would be advantageous if the number of sizes built by each manufacturer could be reduced. The duty on fuel oil was a blow to the home trade of the oil-engine industry; they were fortunate in that a large proportion of their orders came from abroad. During the year they had installed their new type high-speed engines on two shunting locomotives, and two engines had been ordered for L.M.S. shunting locomotives. They had also installed their high-speed engines in pumping stations, electricity works and factories.

The Anglo-Argentine Tramways Co., Ltd., reports gross receipts for 1932 of £3,506,343, as against £3,840,368 in 1931, and net receipts of £409,244 (against £280,445). After payment of interest there was a deficit of £263,306, which added to a debit of £371,223 brought in makes a loss of £634,530 to be carried forward. The number of passengers carried was 420,291,269, a decrease of 9 per cent., which is attributed to increasing competition from motor vehicles and business depression in Buenos Aires. Failure to raise fresh capital resulted in the abandonment of the Retiro-Constitucion subway scheme, and the company's concession has lapsed.

The Middle West Utilities Co.—The receivers of this company have submitted to Mr. Walter C. Lindley, Federal judge, their first formal report describing their active management of the company and its seventy-one subsidiaries since the date of the Middle West receivership on April 15th, 1932. They state that as soon as practicable attention will be directed to the formulation of a reorganisation plan which will recognise equitably the claims of the creditors and security holders of the company.

Hall Telephone Accessories (1928), Ltd., in its interim report, states that the purchase of the freehold of the company's works at Willesden has now been completed, and a small additional building is now being erected. Satisfactory contracts have been obtained by the company, and it is anticipated that the works will remain fully employed throughout the year. General manufacturing is such as to justify the maintenance of the interim dividend at 5 per cent. (less tax).

Chadburn's (Ship) Telegraph Co., Ltd., reports a loss for the year ended March 31st last, after providing for depreciation, of £1,405, against £2,777. This is deducted from £1,513 brought in, leaving a credit of £108 to go forward. The directors have considered the question of the rearrangement of capital, but are not in a position to place a scheme before members at present.

The Atlas Electric & General Trust, Ltd., reports a net revenue for the year ended March 31st last of £159,848, as compared with £198,761 in the preceding year, which, with £44,889 brought in, makes £204,737. The preference dividend is paid, but there is no distribution on the ordinary shares, which last year received 1 per cent. The amount carried forward is £45,487. Meeting: July 13th.

Aron Electricity Meter, Ltd., reports a profit for the year ended March 31st last of £21,322, as against £5,246 in 1931-32. It is proposed to place £11,750 to reserve, and to pay a dividend of 10 per cent., less tax. This is the first dividend since 1927-28, when 4 per cent. was paid. Meeting: July 17th.

Greenwood & Batley, Ltd., report a net profit for the year ended March 31st of £26,442, as compared with £11,919, which with £4,355 brought in makes £30,797. Depreciation receives £6,000 and the ordinary dividend is maintained at 2½ per cent., leaving £9,060 to be carried forward. Meeting: To-day (Friday).

The Lima Light, Power & Tramways Co. reports net receipts for 1932 of S/o 3,033,184, as against S/o 3,974,693. After adding interest on investments, &c., and deducting various charges there was a loss of S/o 4,717,936 (against a loss of S/o 1,966,631). The company has been compelled to suspend the amortisation service of the 6 per cent. first mortgage debentures.

The Electric & General Investment Co., Ltd., reports a net revenue for the year ended May 31st last of £4,580, as compared with £4,841 in the preceding year, to which is added £17,804 brought in, making £22,384. The preference dividend is paid and £296 is placed to reserve, leaving £17,610 to be carried forward.

Thomas de la Rue & Co., Ltd., propose to pay a dividend of 5 per cent. on the ordinary shares for the year ended April 1st last. The last dividend was for the year 1928-29, when 3 per cent. was paid.

The Underground Group.—At meetings held on July 3rd Mr. J. C. Mitchell was appointed secretary to the liquidators of the companies in the Group which are to be wound up as a consequence of the London Passenger Transport Act.

Electric & Musical Industries, Ltd., announces that the half-yearly dividend on the 6 per cent. cumulative preference shares due on July 15th will not be paid. The dividend is in arrears as from July 16th, 1932.

The St. James' & Pall Mall Electric Light Co., Ltd., has announced an interim dividend of 8.4d. per share on the ordinary shares.

The Chiswick Electric Supply Corporation, Ltd., has announced an interim dividend of 5 per cent. (unchanged).

The Kensington & Knightsbridge Electric Lighting Co., Ltd., has declared an interim ordinary dividend of 8.4d. per share, less tax.

The Scottish Power Co. has placed privately a further 200,000 6 per cent cumulative preference shares of £1 each.

Stocks and Shares

TUESDAY EVENING.

THE chief event of the opening of the second half of the calendar year, so far as the Stock Exchange is concerned, is the arrival of the London Passenger Transport Board. With remarkable promptitude, the amalgamating companies—or some of them—were travelling under their new title immediately after the scheme came into operation. Equal celerity has not been shown in the matter of arrangements for the transfers of the five stocks that are to take the place in the Stock Exchange market of the many issues for which the former are to be exchanged. Dealings are expected to start, however, on Monday in next week, July 10th. As mentioned here on various previous occasions, the principal speculative interest centres upon the quotation which the "C" stock will command. For the prices of the others it has been easy to obtain approximate values by the simple process of referring to the securities already existent, but the "C" is a new stock, dependent for its dividend upon the earnings of the combine, and these at present are difficult to estimate owing to the complete change of conditions that will obtain under the amalgamated working. Market activity in the old stocks has somewhat died down, and the only change worth mentioning is a small reaction in the price of Underground Electrics, which now stand at 23s. It is expected that the "C" stock will start at between 73 and 75.

Home Electricity Shares

Interim dividends are making their appearance in the cases of the London electricity supply companies, but, as all of them are likely to be exactly the same as those of a year ago, practically no fresh interest is aroused by the announcements. The Kensington and Knightsbridge, to take one in-

stance, is going to pay 8.4d. per share on July 21st, the same as before. The Chiswick Electricity Supply 5 per cent. interim dividend, due on July 24th, is also unchanged. In these circumstances, the list of prices shows scarcely a variation. Bournemouth and Poole are 2s. better at 74s. 6d. There continues to be a fair amount of business doing in the new shares in this group. Edmundson's new ordinary shares are 33s., after being a little better.

Amongst the Colonials, Victoria Falls ordinary have spurted to 88s. 6d., a rise of 2s. 3d., in further reflection of the satisfaction with the bonus of 5 per cent., making 20 per cent. for the year.

Dollar Stocks

The wild movements in the rate of American exchange have been reflected to some extent in the movements of prices in American and Canadian utilities. Brazilian Tractions recovered to 17¼. International Holdings have been taken in fairly large lines by speculators in this country, and the demand lifted the price to 3. Hydro-Electrics have been a focus of attention, the price revolving round 9¼. It is pointed out in the market that by comparison with some of the non-dividend-paying shares, British Columbia Power "A" look under-priced at the present figure of 28, seeing that the shares are in receipt of a dividend of 2 per cent. per annum. Cautious folks will answer this by reference to the non-assurance of the dividend being maintained, though it is admitted that business in British Columbia and in Canada, too, begins to show signs of recovery from the hard times through which it has lately passed. The Mexican stocks hold their rises, but the bondholders in the Mexico Tramways have received a strong hint that the present position is anything but happy. Although the 5 per cent. first mortgage bonds have not had to go short of their interest and sinking fund appropriations, the sixes have received no dividends since July, 1914.

British and Foreign Traction

The deferred ordinary stock of the British Electric Traction Company has lost no time in recovering the recent deduction of the dividend. At 400, the price shows a gain of 35 points on the week. The preferred ordinary retains its rise at 135. In the list of foreign companies, the Anglo-Argentine Tramways has presented its annual report, in which a loss on exchange amounting to £109,000 is shown. The total loss now comes to £634,000, as against £371,000 in 1931. The first preference shares are ⅛ down, and the second preference ⅛ up, at the common price of 6s. 3d. The debenture stocks are also steady, the effect of the poor report being neutralised by the unfreezing of credits, in the Argentine Republic, that followed the visit in the earlier part of the year of the Argentine delegation to this country.

The prices of Rio Tramway bonds have been moving in correspondence with the jerkiness of the dollar exchange. The 5 per cent. first mortgage bonds are now quiet at 104½xd., the 5 per cent. fifty-year bonds at 80½. Sao Paulo Tramway 5 per cent. debenture stock stands at 72½.

General Rise in Equipment Shares

There has been something like a boomlet this week in the shares of many industrial companies. Money taken from gilt-edged stocks, for fear of depreciation in capital value, has flowed lavishly into trading and commercial shares. Most sections of the industrial market have participated in the activity. Electrical manufacturing and equipment issues came well to the fore. A gain of 3s. 3d. lifted Associated Electrical Industries to 20s. 9d. General Electrics at 45s. are ⅛ up. British Insulated rose 3s. 6d. to 73s. 9d. Callenders and Enfields are harder. Crompton Parkinson ordinary and preference advanced to 18s. 3d. and 30s. respectively. Aron Electricity went up to 38s. 9d. upon announcement of a 10 p.c. dividend—the first distribution since July, 1928 on the ordinary shares. Part of the investment demand is definitely traceable to New York. Philips Lamps rose to 42s. upon purchases by Dutch investors, rendered apprehensive by the fall in the value of the guilder. Upon its becoming clear that the World Economic Congress may fail of its purpose in the direction of stabilised currencies, a quieter tone supervened, and a little taking of profits was noticeable. On the week, however, many of the industrials show substantial appreciation.

Cables and Miscellaneous

The market in cable stocks was not to be outdone by other sections, and price advances are general. Cables & Wireless preference rose 2, to 78½; the ordinary stocks both are higher. Great Northern Telegraphs are 30s. up at 31, for the reason mentioned here last week, *viz.*, an addition to the company's landing licences in this country. Anglo-Americans have improved, though, on the other hand, American Telephone & Telegraphs are 5 lower, at 147½: Internationals are almost unchanged at 22.

Atlas ordinary fell back to 7s. and the preference to 20s. upon the issue of a disappointing report. In the iron and steel department, Babcock & Wilcox put on 3s. 6d., rising to 37s. 3d., a comparatively modest demand coming into a market poorly supplied with stock. Rubber shares are better all round, the commodity improving as a result, apparently, of President Roosevelt's inflationary policy. Tokyo Electric six per cent. strengthened to 82.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1931.	1932.	Price, July 4.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	74/6	+2/-	4 0 4
Brompton Ordinary	1	8½	7	32/6	—	4 6 2
Central Electricity 4½% Deb.	Stock	4½	4½	105	—	4 5 9
Charing Cross Ordinary	1	8d	7	33/0	—	4 4 10
Chelsea	1	8½	7	32/-	-6d.	4 7 6
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	7	7	35/-	—	4 0 0
County of London	1	10½	10½	52/6	—	4 0 0
Edmundsons' 7% Pref.	1	7	7	30/6	—	4 11 10
Elec. Dis. Yorkshire	1	9	9	43/3	—	4 3 4
Elec. Supply Corporation	1	11	11	64/6	—	3 8 4
Kensington Ordinary	1	8	7	33/-	—	4 4 10
Lancs Light and Power	1	7	7	31/3	—	4 9 7
London & Home Counties 4½%Deb.	Stock	4½	4½	107xd.	—	4 4 1
London Electric	1	9	7	32/6	—	4 6 2
Metropolitan	1	10	10	49/6	—	4 1 0
Midland Counties	1	7	7	35/-	—	4 0 0
Mid. Elec. Power	1	8	8	36/3	—	4 8 4
North Eastern Electric Ordinary	1	6	6	30/-	—	4 0 0
Do. 7% Pref.	1	7	7	32/-	—	4 7 6
Northampton	1	10	10	50/-	—	4 0 0
Notting Hill 6% Pref.	10	6	6	13½	—	4 10 7
North Met. Elec. 6% Pref.	1	6	6	28/6	—	4 4 3
St. James' and Pall Mall	1	8	7	32/-	—	4 7 6
Scottish Power	1	8	8	36/3	—	4 8 2
South London	1	8½	7	33/-	—	4 4 10
Urban Ordinary	1	7	7	37/6	—	3 14 8
Westminster Ordinary	1	8½	7	32/-	-6d.	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/9	—	7 4 7
Yorkshire Elec.	1	8	8	42/6	—	3 15 3

HOME RAILS.

Central London Ord. Assented	Stock	4	4	90	—	4 9 0
Metropolitan	„	2½	1½	73	—	2 4 6
Do. District	„	4½	3	69½	—	4 6 4
Underground Electric	1	7	4½	23/-	-6d.	3 18 3

TELEGRAPH AND TELEPHONES.

American Tel. & Tel.	$100	9	9	147½	-5	6 2 0
Anglo-Am. Tel. Pref.	Stock]	6	6	106½	+½	5 12 8
Do. Def.	„	1½	1½	2¼	+½	6 5 0
Cables & Wireless 5½% Pref.	„	2¾	2¾	78½	+2	3 10 0
Do. A 7½% Ord.	„	Nil	Nil	27½	+1	—
Do. B Ord.	„	Nil	Nil	12½	+½	—
Globe Tel. and T. Ord.	10	Nil	2½	11¼	+⅛	2 4 5
Do. do. Pref.	10	6	6	12	+¼	5 0 0
Great Northern Tel.	10	20	20	31	+1½	6 9 0
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	2½	-1/8	*4 3 6

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	6/3	-1/8	—
Do. do. 2nd Pref.	5	Nil	Nil	6/3	+1/8	—
Do. do. 5% Deb.	Stock	Nil	Nil	14½	—	—
British Electric Traction Def. Ord.	„	5	5	400	+35	—
Do. do. Pref. Ord.	„	8	8	135	—	5 18 5
Brazil Traction	100	—	—	17½	+½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	19/-	—	—
London United Tram Deb.	Stock	4	4	72½xd.	—	5 10 4
Mexico Trams, 5% Bonds	—	5	5	38½	—	12 19 8
Mexican Light Common	100	Nil	Nil	14¼	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	70½	—	7 1 10
Victoria Falls Ord.	1	15	20	88/6	+2/3	4 10 7
Yorkshire (West Riding)	1	Nil	Nil	10/-	+1/-	—

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	4	4	20/9	+3/3	3 17 2
Do. Pref.	1	8	8	28/3	—	5 13 3
Babcock & Wilcox	1	14	9	37/3	+3/6	4 16 8
British Aluminium Ord.	1	5	5	28/3	—	3 10 10
British Insulated Ord.	1	15	15	73/6	+3/6	4 1 9
Brush Ord.	Stock	Nil	Nil	35	—	—
Callender's	1	15	15	3 7/8 xd.	+1/8	4 14 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/-	22½	—	18/3	+9d.	6 5 7
Do. 8% Pref.	1	8	8	30/-	+1/8	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	12/6	—	—
Enfield Cable Ord.	1	25	25	4 7/8	+1/8	5 12 9
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	12/6	—	—
Ever Ready	5/-	35	35	28/-	+6d.	6 5 0
Ferranti Pref.	1	7	7	24/3xd.	—	5 15 6
G.E.C. Pref.	1	6½	6½	29/0	—	4 9 8
Do. Ord.	1	8	8	45/-	+1/8	3 11 2
Henley's	1	30	30	6 7/8	-1/8	4 11 2
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	8/9	—	—
Johnson & Phillips	1	5	5	18/3	—	5 9 7
Siemens Ord.	1	7½	6½	23/9	—	5 9 5
Telegraph Construction	£1	Nil	Nil	18/3	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1931

32836. "Protective apparatus for electric systems." British Thomson-Houston Co., Ltd. November 26th, 1930. (393577).

32851. "Electrical treatment of liquids having great dielectric strengths." L. Mellersh-Jackson (Soc. l'Air Liquide Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude). November 26th, 1931. (393623.)

33335. "Musical stringed instruments with electric relay transmission to a loud speaker." Siemens & Halske Akt.-Ges. December 1st, 1930. (393612.)

33507. "Electric signalling or control systems for use in electric protective systems." General Electric Co., Ltd., F. B. Willis and E. P. L. Westell. December 3rd, 1931. (393613.)

33523. "Electric condensers and adjustment devices therefor." R. Atkins, A. E. Frearson and E. J. L. Delfosse. December 3rd, 1931. (393582.)

33526. "Telephone systems." Automatic Electric Co., Ltd. December 18th, 1930. (393583.)

33682. "Electric motors." British Thomson-Houston Co., Ltd., and A. F. Heinrich. December 4th, 1931. (393594.)

33707. "Radio direction finding apparatus." R. J. Hardy and Soc. des Etablissements H. Lepaute. December 4th, 1930. (Patent of addition not granted.) (393595.)

33905. "Electrical variable attenuation networks." Marconi's Wireless Telegraph Co., Ltd., and W. P. Wilson. December 7th, 1931. (393616.)

39916. "Electric motors." International General Electric Co., Inc. December 8th, 1930. (393617.)

34178. "Electric secondary or storage batteries." Drumm Battery Co., Ltd., J. J. Drumm and T. Hagyard and R. H. D. Barklie. December 9th, 1931. (Addition to 365, 125.) (393629.)

34187. "Volume control arrangements for telephone or like signalling circuits." Electrical Research Products, Inc. December 10th, 1930. (393633.)

34364. "Terminal posts for electrical instruments." Westinghouse Brake & Saxby Signal Co., Ltd. March 24th, 1931. (393650.)

34370. "Cathode-ray tubes." U. W. Doering. December 13th, 1930. (393651.)

34389. "Telegraph exchange systems." Creed & Co., Ltd., and R. G. Griffith. December 11th, 1931. (393652.)

34399. "Electric motor starters." A. West & Co., Ltd., and V. Breeze. December 11th, 1931. (393653.)

34481. "Television image producing apparatus." Electrical Research Products, Inc. December 13th, 1930. (393657.)

35063. "Electric switches for motor control systems." A. E. K. L. Grimsdale and Associated Electrical Industries, Ltd. December 23rd, 1931. (393676.)

1932

43. "Dynamo-electric machines." Electromersible Motors & Pumps, Ltd., and T. L. R. Cooper. January 1st, 1932. (Addition to 355509.) (393680.)

628. "Arrangement for the suppression of the higher harmonics in the magnetising current of iron-saturated transformers or choking coils." Siemens-Schuckertwerke Akt.-Ges. October 14th, 1931. (Addition to 387815.) (393682.)

3842. "Electric cables." C. J. Beaver, E. L. Davey and W. T. Glover & Co., Ltd. February 9th, 1932. (393694.)

5297. "A.c. motors." C. Collaro and Collaro, Ltd. February 22nd, 1932. (393702.)

6109. "Road traffic signalling systems and circuit controllers therefor." British Thomson-Houston Co., Ltd. February 28th, 1931. (393707.)

7641. "Electric circuit breakers." Ferguson Pailin, Ltd., and G. Pailin. March 15th, 1932. (393715.)

8127. "Electric current limiting apparatus." G. Wall and Associated Electrical Industries, Ltd. March 18th, 1932. (393719.)

8192. "Electric lamp fittings of the flame-proof type." Maxlume Lighting & Heating Co., Ltd., and J. W. Forth. March 18th, 1932. (393721.)

8337. "Gaseous electron-discharge tubes and control circuits therefor." Igranic Electric Co., Ltd. March 20th, 1931. (393722.)

9309. "Electric cycle lamps." Ever-Ready Co. (Great Britain), Ltd., and A. H. Sheppard. March 31st, 1932. (393726.)

10109. "Press-button electric switches." General Electric Co., Ltd., and S. W. Richards. April 8th, 1932. (393728.)

11939. "Electric lighting and battery-charging systems." H. Taylor, W. Hellewell, B. M. Berg and T. L. Berg. April 26th, 1932. (393736.)

11982. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and R. G. Dixon. April 26th, 1932. (393738.)

12546. "Amplifiers for photo-electric currents." M. Von Ardenne. May 2nd, 1931. (393741.)

14583. "Telegraph transmission systems." Siemens & Halske Akt.-Ges. May 23rd, 1931. (393749.)

15994. "Electric conversion systems." International General Electric Co., Inc. June 6th, 1931. (393752.)

16997. "Wireless receiving system." M. Von Ardenne. June 18th, 1931. (393755.)

18296. "High-frequency electrical cable." Naamlooze Vennootschap Hollandsche Draad-En Kabel-Fabriek. August 24th, 1931. (393763.)

19246. "Windings of transformers and other electrical machines." Ateliers de Constructions Electriques de Charleroi. July 13th, 1931. (393770.)

24867. "Current collectors for electric vehicles." Westinghouse Electric & Manufacturing Co. September 29th, 1931. (393810.)

26511. "Manufacture of continuously loaded signalling conductors and like members and lapping machines for use in the manufacture thereof." W. S. Smith and C. V. Garnett. December 9th, 1931. (Divided application on 34185/31.) (393634.)

27065. "Trucks for electrically propelled vehicles." British Thomson-Houston Co., Ltd. September 29th, 1931. (393820.)

27084. "Radio-electric musical instrument with keyboard and thermionic valves." E. E. Coupleux and J.A.M.V. Dep. Givelet. October 16th, 1931. (Addition to 359967.) (393821.)

27085. "Radio-electric musical instrument with keyboard and thermionic valves." E. E. Coupleux and J.A.M.V. Dep. Givelet. October 27th, 1931. (Addition to 359967.) (393822.)

28214. "Cathode-ray tubes." International General Electric Co., Inc. October 9th, 1931. (393826.)

29214. "Electric horns, particularly for vehicles." R. Bosch Akt.-Ges. November 5th, 1931. (393833.)

30559. "Conduit-connecting means." British Thomson-Houston Co., Ltd. (General Electric Co.). October 31st, 1932. (393846.)

31170. "Luminous electric discharge tubes." General Electric Co., Ltd. November 25th, 1931. (Addition to 377584.) (393850.)

32874. "Methods of electrolytically producing endless metal bands." International General Electric Co., Inc. November 21st, 1931. (393869.)

36706. "Control of low-pressure gaseous electric discharge devices." Akt.-Ges. Brown, Boveri et Cie. December 28th, 1931. (393880.)

36792. "Electromagnetic holding or picking up tools." Naamlooze Vennootschap Handelmaatschappij S. Gookes, Jr. May 26th, 1932. (393881.)

532. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 16th, 1932. (393886.)

775. "Radio-gramophone apparatus." Dr. G. Seibt Akt.-Ges. January 7th, 1932. (393888.)

1059. "Devices for the generation of filtration of electrical oscillations by means of tuning forks." C. Lorenz Akt.-Ges. February 20th, 1932. (393889.)

3596. "Apparatus for the electrical separation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (Siemens-Lurgi-Cottrell-Elektrofilter Ges. für Forschung und Patentverwertung). February 6th, 1933. (393903.)

4082. "Electrostatic purification of gases." J. J. V. Armstrong (Research Corporation). February 10th, 1933. (393906.)

4365. "Electrical distribution boards for pillars and the like." English Electric Co., Ltd., A. M. Pooley, and C. A. Wilson. February 13th, 1933. (393908.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 28th:—

Metrovic. No. 540905. Class 5. Unwrought and partly wrought metals used in manufacture.—Metropolitan-Vickers Electrical Co., Ltd., Bush House, Aldwych, W.C.2.

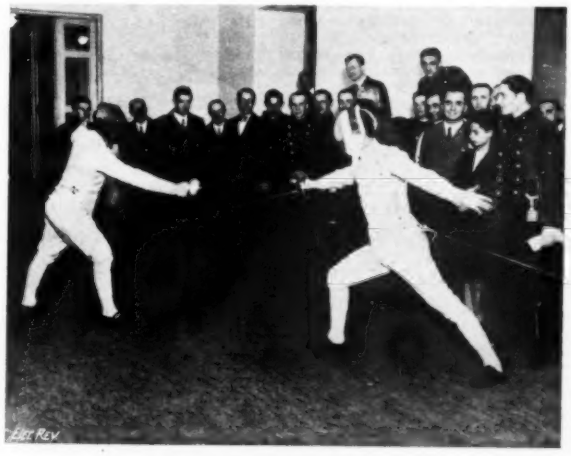
Tenby. No. 536086. Class 13. Electric lighting, heating, and power fittings.—S. O. Bowker, Ltd., 20, Branston Street, Birmingham.

Saaflux. No. 541505. All goods in Class 13.—Benjamin Electric, Ltd., Tariff Road, Tottenham, N.17.

Permitol. No. 541296. Class 50. Electrical insulating substances.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

Electricity in Fencing

THE extending use of electricity is accompanied by some remarkable ramifications into most unexpected fields—even the field of combat. Experiments are now in progress



An electric fencing "referee"

with an "electric referee," which is to officiate at the International Fencing Championship to be held in Budapest shortly. It consists of an electric wire running under the fencer's clothes to the foil with which it is connected. The other end is wound round a cylinder which allows it to unroll itself in the case of attack, and automatically winds itself up when the fencer withdraws in defence. The wire is connected with an apparatus which marks hits by the lighting of a lamp and the ringing of a bell.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick.—Houses (24); R. Carse & Sons, builders, Amble.

Barking.—Factory extension, Ripple Road; Adelphi Press, Ltd. Extensions, Broadway Market; L. E. White.

Barnet.—Estate development, near Dollis Brook; E. H. Waterman.

Basingstoke.—Alterations and improvements to premises of J. Boyer & Son, 7, London Street.

Berkhamsted (HERTS).—Houses, Little Gaddesden and Berkhamsted Rural; R.D.C. surveyor.

Bexley.—Houses (2,325), Westwood Farm Estate; New Ideal Homesteads, Ltd.

Birmingham.—Houses (720), Glebe Estate; Morris, Jacombs & Sons, Ltd.

Bishop's Stortford.—Houses (126), Haymeads Lane; Ashford Builders' Co., Ltd., 36, Bloomsbury Square, London, W.C.

Bolton.—Cinema, Ivy Road (£22,000), for C. J. Spittle. Dairy, Clough Farm, Chorley New Road; Lady Beaumont.

Bournemouth.—Six police houses, Gloucester Road (£2,082); E. H. Sadler. Hotel, shops and flats, Westover Road; Palace Hotel Co. New department, Stourfield School; borough engineer. Alterations and additions, 14-6, Southborne Grove; International Tea Co., Ltd.

Bradford.—Stadium, Rooley Avenue; Bradford Northern Rugby League Football Club, Ltd. Tenements (124), White Abbey area (£51,400); city architect.

Brighton.—Three blocks of all-electric flats, Bevendean Estate; Nye & Donne. Institute, Moulsecoomb Estate (£2,000); borough engineer. Town hall, &c. (£250,000); J. L. Denman, architect. Reconstruction, The Dome and Corn Exchange (£60,000); borough surveyor.

Cheltenham.—Houses (27), Green Hyde; Wheeler & Mansell. Alterations, 351-3, High Street; F. W. Woolworth & Co., Ltd. Extensions, general hospital (£6,500); secretary.

Chesterfield.—Branch premises, Elderway, for Chesterfield and District Co-operative Society, Ltd., West Bars.

Chipping Norton.—Re-erection of sawmills, Heythrop (electrically equipped), for R. Claridge & Sons.

Chislehurst.—Houses (65), Hillcrest Drive; Morrell (Builders), Ltd., High Street, Bromley.

Chorley.—New front, Hippodrome, Gillibrand Street; borough engineer.

Colchester.—Slipper baths, &c., Culver Street; G. T. Morris, architect, St. Peter's Chambers, High Street.

Congleton.—Houses (50), Rood Hill; J. Hood, borough surveyor.

Coventry.—Baths, Foleshill (£46,124); city engineer.

Cramlington.—Houses (40), near Station Road; U.D.C. surveyor.

Dalbeattie.—Houses (20), with electrical work; M. Purdon Smith, architect, 95, Irish Street, Dumfries.

Derby.—Cinema and shops (£100,000), Derwent Street and Tenant Street, for H. E. King.

Dewsbury.—Houses (20), Thornhill Lees; borough architect.

Dudley.—Municipal buildings; Harvey & Wicks, architects, 5, Bennett's Hill, Birmingham.

Dumfriesshire.—Extension, High School (£16,000); County E.C., architect, Dumfries.

Durham.—Schools, Lanchester (£5,060); alterations and improvements to Council School, Esh Winning (£1,700); and remodelling Council School, Burnopfield, for County E.C. (£2,000); F. Willey, architect, 34, Old Elvet.

Eastbourne.—Additions to St. Winifred's School, Meads Road; F. G. Cooke, architect.

Edgware (MIDDLESEX).—Extensions, Redhill Institution (£4,440); county architect.

Edinburgh.—Dairy and shops, Niddrie Mains Road, for St. Cuthbert's Co-operative Association, 92, Fountainbridge; Society's architect.

Enfield.—Houses (54), Brick Lane; E. D. Judd, 9, Southampton Street, W.C.1. Houses (20), Larmans Road; W. Goodchild & Co. Extensions, Lamp Works, Millmarsh Lane; Cosmos Lamp Works, Ltd.

Epsom.—Houses (36), Stoneleigh Estate; C. E. Truett & Co. Houses (40), Cuddington; A. F. Houfton & Co., Ltd. Houses (28), Stoneleigh Estate; R. Purdue & Son.

Essex.—Girls' high school, Romford (£32,960); T. J. Bailey & Son, builders, Chelmsford. South-East Technical College (£120,000); treatment centre, South Benfleet (£2,000); and extensions, Palmer's Endowed School, Grays (£8,000), and St. Chads Road School (£2,650); county architect.

Falkirk.—Shopping centre (£12,000); J. G. Callander, architect.

Goole.—Church of St. Mary (£3,000); Rev. H. E. Wall, vicar.

Guildford.—Flats, restaurant, &c., London Road; Surrey County Halls (Guildford), Ltd. Swimming pool, &c., Pewley Fort; Mr. Lakeman.

Hampshire.—Extensions, South Hayling schools (£6,435); county architect, Winchester. Extensions, Tatchbury Mount Mental Colony (£20,000); County Council and Bournemouth Corporation.

Herne Bay.—Houses (25), Green Lees, Chestfield; G. Reeves, May Downs Estate Office.

Hertford.—Houses (21), Sand Hill Housing Estate; Rd. Ginn & Son, builders, 75, St. Andrew's Street.

Hillingdon.—Extensions, hospital nurses' home (£16,293); Fassnidge & Sons, Ltd., Uxbridge.

Horsham.—Institution, extensions (£8,000); J. W. Wright, Ltd.

Ilford.—Extensions, maternity home (£30,029); borough surveyor.

Irish Free State.—(BALLINA, Co. MAYO).—Five blocks of houses, Upper Mill Street; P. A. Calleary, engineer to U.D.C. (BALLYVOURNEY, Co. CORK).—Building for Preparatory College; T. Cassedy, secretary, Office of Public Works, Dublin. (CORK).—Residence, Woolahra Park, Douglas Road; J. R. Boyd Barrett, chartered architect, 61, South Mall.

Isle of Ely.—Electric lighting installation, junior mixed and infants' schools, Broad Street, Whittlesey; R. D. Robson, county architect, County Hall.

Isleworth (MIDDLESEX).—Laundry reconstruction, Warkworth House (£12,900); county architect.

Lancaster.—Houses (500), and flats, Marsh Estate; borough engineer.

Lanchester.—Houses (32), Ebchester and Langley Park; E. Simpkin, R.D.C. surveyor.

Littlebourne (KENT).—Laundry; S. W. Arnold.

Liverpool.—Houses (58), Bishopsgate Street; T. Wainwright & Sons, architects, 11, Lord Street. Houses (47), Bull Lane; Williams & Kelly, architects, 13, Harrington Street. Houses (15), Sandy Lane, Fazackerley; A. H. King, builders, 2, Middleton Road. Church, Timm's Lane, Formby, for the Rev. Father J. Gardner, Church of Our Lady of Compassion, School Lane (electrical installations); Tyson's (Contractors), Ltd., builders, Dryden Street.

London.—(BERMONDSEY).—Houses (1,500); borough surveyor. (FINSBURY).—Extensions, Metropolitan Water Board offices, Rosebery Avenue (£35,500); H. Austin Hall, architect. (GREENWICH).—Reconstruction of Thames Street area (£103,000); L.C.C. architect. (HAMMERSMITH).—Shops (34) and flats (354), Latimer Foundation (£325,000); syndicate. Town hall, Brook Green (£163,000); Sir Brumwell Thomas, architect. (KENSINGTON).—Tenements (44), Talbot Grove (electric lighting installation), (£27,000); borough engineer. (PARK ROYAL).—Estate development, Western Avenue; Allen & Fisher. (POPLAR).—New road to docks (£120,000); L.C.C. engineer. (ST. MARYLEBONE).—Flats, Chesterfield Street and New Chesterfield Street; C. Head & Co. (ST. PANCRAS).—Town hall, Euston Road; A. J. Thomas, architect. (WILLESDEN).—Technical institute, Dudden Hill (£53,264); Wm. Moss & Sons, Ltd., Cricklewood. (WOOD GREEN).—Renovation of Alexandra Palace (£132,000); trustees.

Longton (STAFFS).—Houses (96), Ashwood; J. W. Thornley & Sons.

Lowestoft.—School, Notley Road; S. W. Mobbs, architect, Town Hall.

Luton.—Houses (100), Nunnery Lane; Wm. Reeve, builders, Elm Branch, Tudor Road.

Maidenhead.—Houses (50), Boyn Valley Road; F. P. Scott & Co., Ltd.

Manchester.—Municipal offices (£711,000), and operating block, Withington Hospital (£10,000); city architect.

Morecambe.—Houses (30), Branksome Drive; H. Proctor. Church, Clarke Estate; Church of England trustees. Estate development, Longton Drive; Harrison & Moore.

Newcastle-on-Tyne.—Houses (63), Beverley Terrace, Station Road, and Wharrier Street; W. C. Leach, builder, Coutts Road, Walkergate.

Newton-in-Makerfield.—Houses (100), Newton-le-Willows; J. Elston, U.D.C. architect, 18, Queen Street, Earlestown.

Northampton.—Houses (31), Billing Road; W. R. Wilson. Houses (40), Birchfield Road; A. Glenn & Sons, Ltd. General hospital; Brown & Henson, architects, 83, St. Giles Street. Ten shops, Wellingborough Road; F. B. Meyer. Reconstruction of factory, Wycliffe Road; Horny & West, Ltd.

North Riding.—Senior Council School (440 places); J. R. White, county architect, County Hall, Northallerton.

Northwich.—Houses (50); F. L. James, U.D.C. surveyor.

Oxford.—Houses (134), Cutteslowe Estate (£43,000); J. Aston & Son, Coventry.

Plymouth.—Development of Swilley Valley Estate; St. Aubyn estates.

Ponders End (MIDDLESEX).—Houses (33), Southfield Road; G. W. Newman. Two factories, Queensway; Churchbury Investment Co., Ltd. Extensions, Summerfield Works; Thos. Morson & Son, Ltd.

Pontefract.—Houses, Brotherton Ferrybridge, and Whitley (£35,000); R.D.C. surveyor.

Retford.—Court houses (£8,000); H. James, builder, Mansfield.

Ross-shire.—Academy, Dingwall (£42,000); County E.C. architect.

Scarborough.—Premises for Montague Burton, Ltd., Hudson Road, Mills, Leeds; W. Birch & Sons, builders, Harrogate.

Shenley (MIDDLESEX).—Buildings, mental colony (£103,535); county architect.

Somerset.—County offices, Taunton (£71,497); W. T. Nicholls, Ltd., builders, St. Paul's Road, Gloucester.

Sompting (SUSSEX).—Estate development, Cokeham; H. P. Brazier.

South Shields.—Shop premises, Green Street, for Moores Stores, Ltd.; E. Milburn, Richmond Street, Sunderland.

Stirlingshire.—Secondary school, Kilsyth (£51,922); architect, County E.C., Stirling.

Stockton-on-Tees.—Houses (22), Grosvenor Road; C. J. Boyd, builder, 27, Oxford Road, Linthorpe.

Stoke-on-Trent.—Extensions, poor law institutions (£17,000); city engineer.

Surrey.—Central laundry with equipment, Farnham (£18,575); clerk, Kingston-on-Thames.

Wembley.—Development of Harrow Road; C. & F. Day, Ltd., High Road, Finchley, N.

West Riding.—Infants' school, Airedale, Ferry Fryston; education architect, Wakefield.

Whitby.—Houses (34), and shops, Gallows Close Estate; R. A. Wilson & Son, builders, Spring Hill.

Whitstable.—Houses (40), Swalecliffe; T. H. R. Emmerson.

Winchester.—Houses (115), Fair Oak;; A. E. Udall, builder, Hillcroft, Cobden Avenue, Southampton.

Wortley (YORKS).—Houses (88); R.D.C. surveyor.

York.—Houses (24), Leyland Road; J. N. Dunn. Alterations and electrical reconstruction, Theatre Royal; S. Weetman Crawshay, Scarborough.